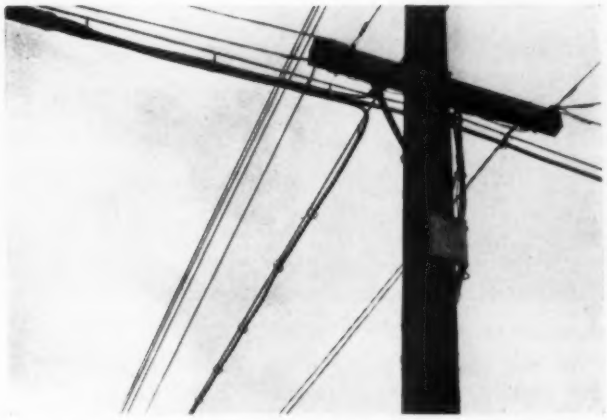
Telephony

April 18, 1936

Aerial Cable Failures; Their Prevention

By ROBERT DE VORE

COMMON CAUSES of breaks in the cable sheath. Suggestions for elimination of preventable sources of trouble, including tree interference, danger from lightning and possible trouble where joint construction with power lines is used. A suggested cable maintenance program



Properly Supported Branch Splices, Cables and Terminal.

TO MAKE the study of aerial cable as simple as possible, the cable should be considered merely as a number of conductors, insulated from one another, and grouped together under a common covering or lead sheath. This article is not intended to consider multiple, loaded, toll or carrier cables but only to cover the common causes of cable failures due to breaks of the lead sheath.

The main causes of cable failures may be divided into two classes: Preventable and unavoidable. We shall first consider the preventable class and divide it into ten groups: Rings, trees, supporting strand, lightning, electric light and foreign wires, office entrances, atmospheric conditions, slack, improper support and vibration. These are the main contributing causes of aerial cable trouble against which we have some means of protection.

The common method of supporting aerial cable is by the use of strand or messenger with a suitable ring, crimped or sprung on it, in which the cable is supported. These rings must be uniformly spaced at a distance of 20 inches, except over railroad crossings, where the spacing is changed to 12 inches. The rings must be of proper size to fit the cable supported, large enough to allow reclipping and yet small enough to prevent the cable from rolling.

The 20-inch spacing has been proved in experiments to be the distance which will adequately support the cable and prevent undue wearing of the armor. It is easily seen that any variation of this spacing will place excessive weight on one or more rings, allowing the cable to sag and form loops between the wide-spaced rings. This wide spacing may be caused by the rings slipping together, from improper application, or by reason of the cable swinging into foreign objects, trees, wires, etc.

Use of the correct ring size is very important, as a small cable rolling in a too large ring will be needlessly ring cut, and its usefulness be shortlived. Generally speaking, the better plan is to use the smallest ring that will allow reclipping or re-ringing without squeezing the cable. The rings should have a large, smooth surface at the point of contact.

In considering the subject of trees, we may safely estimate that 10 per cent of our trouble is caused by them. In most cases this is due to the limbs rubbing a hole in the armor. Sometimes, however, the limbs are too small to do this but, by their continual whipping of the messenger, loosen the rings, causing them to slip and bunch together,

allowing the cable to form a loop.

This swinging loop causes ring cutting at the ends of the loop, and the armor becomes crystallized. As this loop becomes larger, the cable will creep to it from a distance of six or more spans, causing strain on some corner or splice some distance away.

Large limbs lying on the messenger do two things: They cause the messenger and cable to sag, and the cable to become ring cut at the adjacent poles. Second, the vibration of the limb hammering on the cable will cause ring cuts throughout the entire span.

Because of the rapid growth of trees, and the fact that trimming or pruning really promotes growth instead of giving permanent clearance, we must use some other method. In the case of large limbs, we can usually lower the messenger to clear, or tie it off to some adjacent limb with wire and an eyebolt through the limb. In the case of smaller limbs we can do neither.

Improper Use of Rings to Support Corner.

The best method of combating small limbs is with the use of cable moulding. This is a half-round moulding or case made of fir, which may be slipped over the cable in the present rings, to give complete covering and protection. Cable moulding is made in eight-foot sections, of various diameters, to accommodate different sizes of cables. Any length may be covered by starting with a half or four-foot section and staggering the joints or splices, as in brickwork.

This moulding should be tied together and to the rings with four single turns of a small gauge tinned copper wire. The protection should extend three feet past the last limb involved. Ties should be placed at four-foot intervals throughout the section.

In an entirely new cable plant the messenger and anchors will be tight, but after a few years' service, there will be evidence of some stretching. When this is apparent, it may be pulled back as near the original as possible; and, since this will remove the weathering or stretch, the messenger should hold this shape without attention for a long time.

Excessive slack in spans will cause the rings to cut the armor both at poles and throughout the span, while slack guys will cause the cable to creep away from corners and form loops.

Considerable attention must be given to road crossings, and all cables measured to insure sufficient clearance, to conform to state laws and safety practices. Road clearance is measured from the center of the road to the low point of the cable. Cables hung over buildings must be securely supported to assure clearance.

In order to prevent cable from slipping or moving on long or steep grades, some method must be used to anchor the cable to the supporting strand. The preferred method is with the use of a heavy galvanized iron clamp which bolts around the messenger and cable, the cable being protected with a shim or bushing of soft lead. This grade clamp holds the cable and messenger securely together, preventing any separate movement. These clamps are furnished in sizes to accommodate different diameters of cables.

While we cannot stop lightning, we can ward off some of its effects. Because of the fact that the messenger is grounded, it provides a good path to carry off this high potential, and we should make sure that we provide a good ground connection for it.

At all terminal poles where we have a heavy feed of open wire, the messenger is grounded, either with a standard pipe ground at the side of the pole or by means of a coil of messenger stapled on the butt of the pole. In either case, the end of the messenger thus used is carried up the pole, where it is securely bolted with a three-bolt clamp to the messenger supporting the cable. A quantity of coke is generally used to collect and hold moisture for the ground connection at the butt of the pole.

It is equally important that we bond or connect the cable to the messenger. This bonding should be done approximately every thousand feet. It may be done with a small strap armor or lead, 20 inches long and about an inch wide, with one end soldered to the cable and the other secured to a one or two-bolt clamp on the strand.

Another method is with the use of bonding ribbon, a tinned copper strip about a half-inch wide, which is also soldered and bolted. This may be applied to the clamp supporting the cable at the pole, but should never be placed on a sleeve or at a splice. The main essential is to securely connect the cable and strand electrically.

At all points where we have a feed of over a half-mile of circuit of open wire, we must make provision against lightning. This may be done with the use of a protected type terminal, which makes provision for fuse and carbon block protection; or where the need of a large capacity terminal is not indicated, by the use of a smaller type protector unit, which employs only carbon blocks with a ground connection.

This unit is separate from the cable terminal itself and is connected directly to the jumpers on the open-wire leads. Care must be exercised to maintain this fuse and carbon block protection at all times in order to prevent damage to the cable pairs.

The popularity of joint construction with power companies has helped greatly to reduce cable trouble caused by contact with electric light wires. However, though we may be using this construction, we must be sure we have sufficient clearance to avoid trouble from this source. The overhead wires may slack down on the cable, street light wires may be blown against terminals or cables on poles, and the like.

Where the construction is of the older type, service drops may engage most of our attention. Where the light wires cannot be rerouted, we may protect our cable with wood moulding, or by means of a wooden box or case to cover both cable and messenger. This same wooden

guard should be used over street car trolley wires, where the clearance may be limited, to avoid injury. A small bolt on the messenger at the ends of the guard will prevent it from slipping.

In any case of an electric wire having come in contact with a cable, we should carefully check both strand and cable for a distance of half a span on both sides of the trouble to make certain there are no further burns at the rings.

Use of Wood Moulding Through Trees.

Office entrances and entrances to other buildings may cause us the most trouble, just at the point of contact with the building. Unless the cable is securely fastened to the supporting structure, we may have a break in the armor due to a slight vibration or swinging. The cable should make a slight upward slant entering the wall and the outside opening closed around the cable with plaster of paris, if in other than a frame building. In this case, a square piece of lead, large enough to fully seal the opening, may be soldered around the cable and nailed to the wall, with the top end of this shield nailed under the siding above.

This entrance must be sealed to prevent moisture following the cable. For small exchanges the supporting structure may consist of a single section of heavy pipe with the cable securely fastened underneath, or it may be of a ladder-like section laid flat covered with a heavy weather-proofed plank on which the cables are laid, fastened with suitable clamps. Messenger and rings are also used for this last span; in any case, the cables must be secure at the point of entrance.

A rather uncommon cause of trouble is from the effects of gas or acid fumes or smoke in railroad centers or manufacturing cities. This is more of an indirect cause, as the rings will tend to corrode and becoming rough and pitted will cause severe ring cuts. In most cases, the armor itself will not be affected by the atmospheric conditions. As these conditions are of a local nature, they demand individual rather than general treatment.

Both messenger and cable are subject to change caused by variations in temperature. The lead armor, because of its crystalline body, goes through more of a reaction than the wire of the messenger. It will expand more in extremely hot weather and will contract just a little less in cold than the amount of expansion. There is actually a gain in the length of a long section of cable that has been in service for years.

Of course, this gain will be slight but it occurs often enough to cause the cable to assume a "snaky" or "wavy" appearance in the spans. In the case of larger or full-size cables, it will tend to cause the cable to bow out and away from the poles. In extremely hot weather the center of this bow may be seven or eight inches from the pole. Regardless of the size of the cable, this peculiar movement causes the armor to wear and cut at the rings.

Some companies follow a plan of pulling slack on cable which shows this "snaky" or "wavy" appearance. If the small loops between rings are quite pronounced and the cable has been in service longer than two or three years, trouble may result from breaking the cable at the top of each small loop.

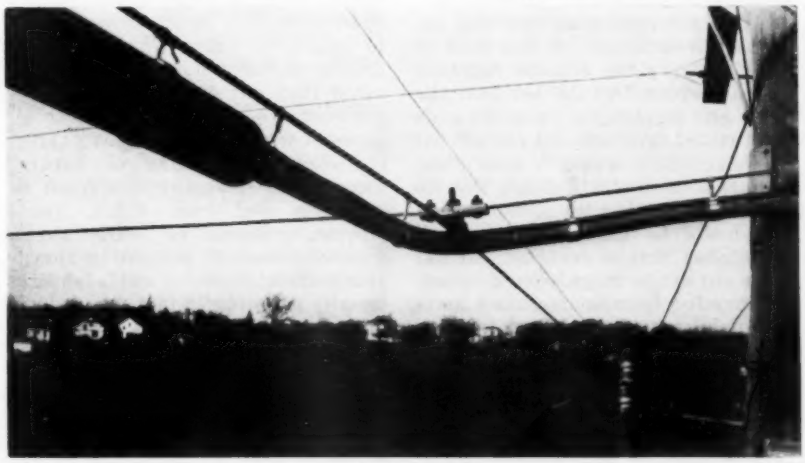
The two rings directly next to a corner should be replaced with wire ties spaced 20 inches apart with the first one 10 inches from the center of the turn. These will prevent creeping and securely support the cable through the turn. When the corner occurs at a splice, the cable between the splice and the corner should be supported with ties.

In case the cable is pulled, a very careful check must be made to determine if such breaks have occurred and, of course, they should be sealed immediately. In the case of large cables bowing at the poles, the rings on opposite sides of the poles should be replaced with a wire tie and the armor carefull checked for evidence of cutting by the rings. Between rings the cable should be as nearly straight and level as possible.

There is always considerable wear at every point where the cable turns. This wear is caused by the use of rings at the corner. It has been proved that as there is continual movement of the cable, this movement is more apparent at corners because of the difficulty of proper support.

At terminal tap splices, ties should be used between the sleeve and the pole, with one tie approximately three inches from the end of the wiped joint. When a splice occurs in a cable it should be remembered that the lead sleeve requires special support to prevent excessive ring wear at the ends of the sleeve and to avoid breakage of the wiped joints.

This support is best accomplished by the use of a short, thin strip of light galvanized iron (about 18 or 20 gauge), an inch wide, not quite large enough to circle the sleeve. Punch a small hole about half an inch from each end to admit a length

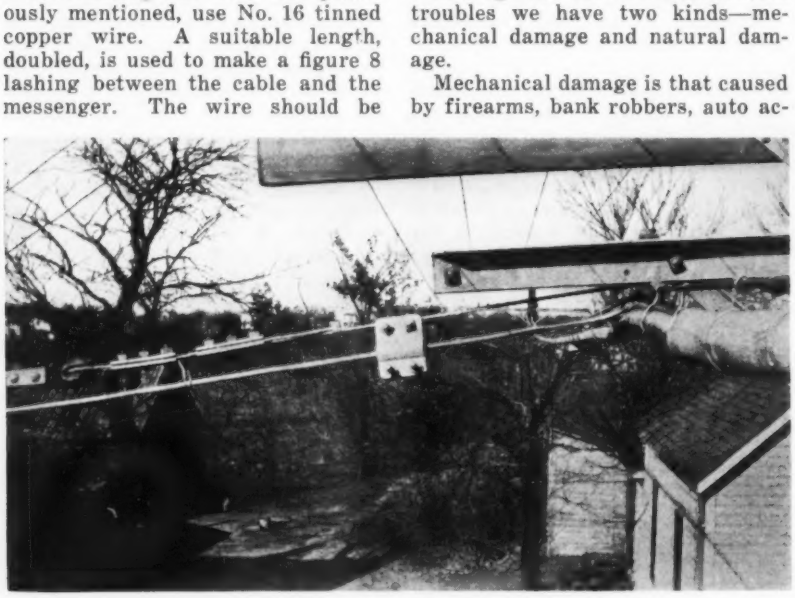


Corner Correctly Supported by Ties.

of No. 12 wire; center the metal strip on the wire, bend the hanger U-shaped and bring the ends together over the top center of the sleeve with three or four twists of the wire.

The tails of the wire are then taken over and around the messenger and twisted together. Care should be taken that the hanger and the rings each share their part in supporting the sleeve.

For making the wire ties previously mentioned, use No. 16 tinned copper wire. A suitable length, doubled, is used to make a figure 8 lashing between the cable and the messenger. The wire should be given a complete turn around the cable and strand at each wrap, and the completed tie consists of ten strands of supporting wires.



Use of Grade Clamps and Ties.

After the last wrap over the cable, the remainder of the wire is used to bring the strands together in a compact bundle between the cable and messenger when the ends are twisted together and cut off. It is well to use a small lead shim over the cable itself under the tie to prevent cutting the armor. This tie should be made securely, and care taken that it does not lift the cable out of the rings when finished.

Vibration from an overhead open-wire lead may cause damage from ring cutting. This will be more noticeable where the lead is exposed to high winds. Ring cutting is very different from ring wear, and may be recognized by a rough, jagged cut in the armor and a residue of lead particles on the ring at the point of contact. Ring wear will show a smooth, clearly worn mark on the cable and a bright point of contact on the ring.

The length of service of the cable and the depth of the ring cutting will determine the work necessary for its cure. At no time should any rings be placed on a cable farther than 10 inches from the supporting clamp on the pole. This spacing has been found most beneficial in overcoming vibrational ring cutting, where only rings are used. Various types of ring saddles and double rings are being tried but this spacing has been made standard at these locations.

Among the list of unavoidable troubles we have two kinds—mechanical damage and natural damage.

Mechanical damage is that caused by firearms, bank robbers, auto accidents, etc. The small boy with a rifle and hunters along a highway where there is a toll or farm cable, cause quite a little grief during open seasons. Bank robbers seem to prefer to carry on their work during daylight hours, so it is not often they cut cables to stop communication—but there have been cases of wire thieves stealing cable.

Under the heading of natural damage, we class animals—such as squirrels and rats — fire, sleet-storms, cyclones, etc. Of course, squirrels seem to delight in sharpening their teeth on cable sheath, usually gnawing it just far enough to get through the lead. For some unexplainable reason, this occurs quite frequently at corners.

Wind and sleet storms, if they do not actually tear the lead down, cause such unusual vibration and jumping of the messenger that serious ring cuts and breaks are found in their wake. Birds may build nests in protected terminals and may cause considerable moisture damage to lugs and connections unless the jumper entrances are carefully closed.

Since we have defined the common causes of cable failures, it might be well to outline some plans of covering or inspecting a cable plant with a view of preventing trouble. This preliminary inspection should be done by a cableman and helper who can make such repairs as may be immediately necessary.

Suggestions for Maintenance Program

This inspection should first include a very careful check of the entire cable plant, followed by a detailed report showing the amount of work necessary to correct these failures, as soon as convenient or as is deemed needed according to the plant's condition.

First, make a very careful check of all causes of trouble which have been outlined as preventable:

Check cause and extent of ring cutting; location and disposition of tree conditions (allowing for at least two years' clearance); check guys and railroad crossings for proper clearance; inspect all points where there is excessive strain apparent and locate broken poles.

At this time, it is advisable to make corrections where the appearance and condition are such that cable trouble may be caused in the very near future. All locations where further work is needed should be shown in detail on a blueprint with the amount of material needed to make a complete and permanent job included in this report.

Second, following the print carefully, do the work indicated: sealing ring cuts, placing lashing wire ties on all corners, securing tree clearance, spacing rings, checking bonding and building cables, especially office entrances.

Check cable records and maps, clear vacant bad pairs (within reason), inspect all terminals for broken lugs and surface moisture; check working cables for future growth, making recommendations for extensions or changes, and see that jumpers on cable terminal poles are run in a neat manner. Check arc-light wire clearances, and make sure they are all satisfactory before leaving the exchange. Where cables are cleated on poles or clamped on walls, be sure they are securely and correctly supported.

This maintenance program can be worked out during the usually dry season of fall and winter so the plant may be reasonably secure when the rains come later in the spring.

IN THE NATION'S CAPITAL

By FRANCIS X. WELCH.
Special Washington Correspondent for TELEPHONY

DURING the current breathing spell in the Bell investigation before the Federal Communications Commission, your correspondent thought it was high time he was looking into some Federal legislation affecting telephone utilities. Sticking out like the proverbial sore thumb is the Social Securities Act—particularly the old-age retirement feature.

It is already well known that the Bell System, with its 26 subsidiary organizations, will be the biggest contributor to this fund. Because its fiscal statistics are readily available, this little study of the act's operation is based on the Bell. However, the same principles apply—in proportion, of course—to Independent telephone companies, so don't miss the analogy.

At the outset, we are faced with the disconcerting problem that the act, as presently written, makes no allowance or exemption—in fact, takes no consideration whatever—for existing voluntary employe pension systems which have been installed in the Bell System companies for some years.

During the debate on the Social Security Act, in 1935, Senator Clark of Missouri attempted to insert an amendment that would exempt employers using their own retirement systems from payments to the Federal fund in cases where the benefits to the employe were reasonably comparable. This move lost out in the face of emphatic opposition from the progressives who declared that such an exemption would be the means by which the whole act would be sabotaged.

AT the current session the same question has been made the subject of study by a joint congressional committee and it will probably report progress in the very near future. Definite action, however, is not certain before the next session of Congress. This leaves the act operative against all employers, regardless of existing retirement or pension provisions.

This also leaves the Bell in somewhat of a quandary. Should it assume that the act will not be changed and stop making further payments to its own pension fund in order to offset the heavy tax that will have to be paid to the Federal government? Or should it continue its own plan on the assumption that the Federal act will be changed along the lines originally suggested by Senator Clark?

If the Bell guesses wrong on the first alternative, it may find itself abandoning a sound pension system for one of doubtful value and (if the law should be thrown out by the courts) even without any pension system at all. And if it guesses wrong on the second alternative, it will find itself paying double.

INSURANCE experts would not say that the Bell's own pension system is exactly perfect. It would require increasing contributions from subsidiary corporations in order to maintain actuarial soundness. However, it is safe to say that in the long run the Bell's own plan would be less expensive for the system than the Federal act.

It would have the additional advantage of being a safe, sane and sacred obligation between employer and employe, not subject to the caprice of Congress. The Bell's own plan would also result in the money for pensions actually being put aside in a fund reserved for that purpose.

That is the amazing difference between most reputable private pension systems and the Federal act. (Some critics call it the outstanding economic weakness of the Federal act). All of the money paid in by employers and employes to the Federal retirement fund is dumped into the Treasury without any restrictions whatever. There is no earmarking—no special reserve.

These funds lose their identity with other Treasury funds, just like a sack of wheat thrown into a grain bin. Therefore, they become available for any congressional appropriation; and it would not be difficult to imagine this money, that should be set aside for the retirement of aged employes, being voted by Congress to pay soldiers' pensions, or to build such doubtful projects as the Passamaquoddy dam.

There is one limitation: The law says that the Federal funds shall not be invested in any other security than United States bonds. That's a big help. It's like warning a spendthrift that he cannot spend his cash unless he writes out a check on himself and puts it in place of the money he spends.

Of course, it may be said that the credit of the United States government stands behind this sacred obligation, and let us hope that that credit will always be good. The questionable angle is not the credit but the obligation. How long will it remain sacred?

What guarantee is there that during a future period of economic depression and national financial stress, Congress will not yield to the temptation of writing down or writing off the retirement obligations just as it did during the last depression with its "sacred obligation" to purchasers of U. S. gold bonds?

It would probably be unwise to freeze the act by constitutional amendment or otherwise until a period of experimentation has produced the most workable form; but after such period, the only way that 100 per cent confidence of employers and employes in the act can be gained, would be to place its operation in some manner in a special position where it will be safe from interminable congressional meddling. Incidentally, it is not exactly a hopeful portent that the very first year of operation of this act will find the Federal Treasury with a record deficit.

Getting back to the Bell, we find that in 1936 it will have a pay-

COMING CONVENTIONS

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 22 and 23.

Indiana Telephone Association, Claypool Hotel, Indianapolis, April 29 and 30.

Kansas Telephone Association, Hotel Sunflower, Abilene, May 12 and 13.

New York State Telephone Association, Onondaga Hotel, Syracuse, May 20 and 21.

Missouri Telephone Association, Hotel Muehlebach, Kansas City, May 27 and 28.

roll of about $450,000,000, which will be taxed in increasing proportions through 1937 to 1949 in steps of three years. Therefore, using the 1936 payroll as a basis, the Bell will be taxed in 1937, 1938, and 1939 for the retirement fund—in addition to taxes for unemployment insurance — approximately $4,500,000 for each year; from 1940 to 1942, $6,750,000 each year (roughly); from 1943 to 1945, $9,000,000 each year; from 1946 to 1948, $11,250,000 each year; for 1949 and every year thereafter, $13,500,000.

Too many figures have already been given to bother with more mathematics, but any interested reader can figure out very easily just about how much, in all, the Bell will have to pay over to the Federal fund within the next 15 years. Remember, also, this is based on the 1936 payroll. Increased telephone business would, of course, increase the payroll and, consequently, the amount of the tax. In 1930, the banner telephone year, Bell's payroll was around $700,000,000.

Aside from other taxes, it will take a big bite out of gross revenues. Telephone executives, good at figures, have probably figured the tax all the way down to cost per subscriber.

From an actuarial standpoint, the Federal act is said to be full of bugs —the principal one of which is the increasing longevity of persons after reaching the retirement age. This problem has already caused some of the insurance companies to revise premiums on annuities and even to abandon annuity policies altogether.

A COLLATERAL effect of the act on the telephone industry will be the diversion of general purchasing power for the next few years, to the extent of the contributions made under the act. In other words, money which would have been spent in part for telephone securities and telephone service will be diverted into government securities.

Ultimately, of course, this purchasing power will be released in the form of pension remittances to superannuated employes and presumably all industry, including the telephone industry, will receive its share of the benefits directly and indirectly.

AN extended discussion of lobbying activities here in Washington was published last week in this department. A friend of your correspondent, reading over the matter, remarked: "But you have told only half the story. You haven't touched on governmental lobbying."

The objection was perfectly well taken and for "purposes of the record," as the lawyers are so fond of saying, let it here be recorded that the private lobbies—that is to say, lobbies representing private interests as distinguished from political interests—are doing approximately one-half of the lobbying in Washington. Some observers would say that during this administration they are doing less than half.

The private lobbies are on the outside, as it were, trying to influence what goes on inside. But inside, the government itself is honeycombed with lobbies. There are the department lobbyists, trying to get bigger appropriations. The War Department lobbyists, for example, are intelligent and congenial officers (sometimes nicknamed the Brass Hats), who try in various ways to make Congress see the need of a bigger national defense. So it goes with other departments, bureaus, and commissions.

Then there are the patronage lobbyists—sometimes on the government payrolls—sometimes ex-senators or other political has-beens, who "practice law" by swinging jobs for the right parties. There are the Right and Left lobbyists, honeycombing the government departments, trying to influence legislation for this or that theory of government.

It may all be for the best or not, as you view such matters, but the fact remains that when it comes to making Congress jump through the hoops, Franklin D. Roosevelt surely has a way with him.

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"NOTHING OUT OF THE ORDINARY"

By MISS ANNE BARNES

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

I enjoy reading fiction written many years ago. Of course, much of it is long drawn out and tiresome but I don't read such fiction page after page, from cover to cover. Rather, I follow particularly the story of a fiction character I like very much, from cover to cover, and skip the rest of the book that has little connection with the story of this character.

One of the fiction characters I enjoy the most is that portraying the life of the country doctor or general practitioner whose business it was to know how to treat every part of the human anatomy. He was a specialist in the treatment of the entire human body instead of a devotee to some particular branch of medicine or surgery. For this reason he was in closer human touch with the folks in his community than anyone else.

About the time when he was replaced by four or five specialists —in the modern sense of the term—to do the work he had done in his community, for so many years, day and night with no assistance, along came the telephone operator. And ever since, this operator in the small exchange has been performing service to the community with a smile, just as he did.

An operator in a small exchange is like the country doctor in that she must be a general practitioner in her line. Her responsibilities are manifold. Her duties comprise those of chief operator, switchboard operator, bookkeeper, collector and company housekeeper.

To render almost flawless mechanical service in the small exchange is not enough nowadays. When the operator puts her wholehearted interest into every call for service, she holds a place in the life of a community which can be likened only to that of the efficient, self-sacrificing and humanity-loving country doctor.

Sometimes when I ask an operator, "Have you had a very busy day?" she replies, "Oh, nothing out of the ordinary." But what a wealth of meaning she puts into the word, *ordinary*.

Company Ordered to Install Telephone

An alternative writ of mandate directing the Indiana Bell Telephone Co. to provide telephone service in a cleaning establishment at 1606 East 49th street, in Indianapolis, was issued recently by Judge Joseph R. Williams in superior court. The plaintiff is Matilda Nicholas, operator of the establishment. Her attorney said there had been a dispute over an alleged overcharge on a bill and that the company had taken out her telephone.

AIR-CONDITIONING The Telephone Exchange

By RAY BLAIN

MODERN air-conditioning—with year-round cleanliness, summer cooling and dehumidification, and winter humidification—pays big dividends when applied to the telephone exchange. Description of system installed in an exchange reveals information you wish to know concerning this important development

Telephone Operating Room Showing Air Vent in the Upper Corner.

ONLY very recently has the term, "air-conditioning," won a place in the dictionary. Many people have the conception that air-conditioning consists merely in keeping a room, or home, cool in summer; actually, that's only one function of true air-conditioning.

True air-conditioning covers four coordinated types of air control: Control of temperature; control of humidity; cleansing or purification of the air, and even distribution of air without draughts or noise.

In plain language, a truly air-conditioned space must contain air that is as nearly perfect as to moisture content, temperature and purity as is possible for man-made machines to make it. In a telephone exchange the air must be distributed in such a way as to be free from draughts, and the distribution system must be designed to be quiet in operation.

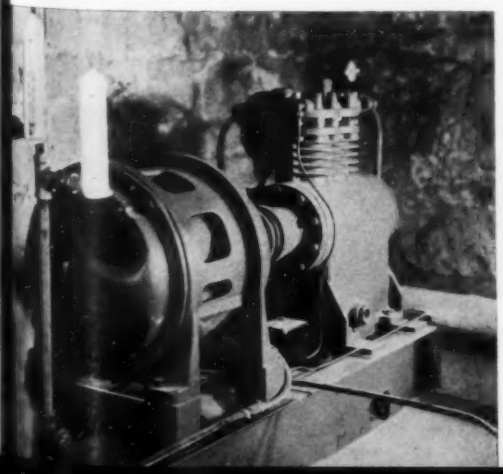
So to merely cool, heat or clean the air in a room by artificial means, to perform any one or even three of these functions—is not complete air-conditioning. However, there are instances where one or two functions of air-conditioning produce entirely satisfactory results and are sufficient for the service required.

It is man's natural tendency to make himself as comfortable as possible. This desire is extended, by the intelligent business executive, to include concern for the comfort of his co-workers and employes. He has learned from observation and experience that when adequate provision is made for their physical comfort, employes work more efficiently and lose less time from work because of illness. The financial advantage to the employer is, therefore, considerable.

The "common cold"—declared to be our national disease—is no doubt caused less from exposure to cold than from our parched and unfiltered indoor air. Taxi-drivers, constantly exposed to the snows and cold of New York's winters, are said to have fewer colds than those who spend the greater part of their time indoors in winter, and arctic explorers are said to have no colds at all.

Air-conditioning of the proper type is truly wonderful, we must all agree, although few seem to realize that this wonder of the age, if given a chance, will prove its greatest worth in our modern telephone exchanges.

Dust has ever been one of the most deadly enemies of delicate telephone equipment. Large exchanges have for years utilized ventilating systems with special filters to exclude dust. Modern air-conditioning now provides, at a cost within reason, year-round cleanliness in the small and medium-sized exchange, plus summer cooling and dehumidification, and winter humidification.



View of Compressor; the Thermometers Indicate the Temperature of the Water as It Enters and Leaves the Compressor.

While it is true that air-conditioning is comparatively new, its principles are old and thoroughly understood by reliable manufacturers, engineers and contractors. Possibly some installation is known to you which did not prove a complete success; if so, undoubtedly the owner either specified a cost so low that it was impossible to install a satisfactory system, or it was installed by other than a reliable and permanently-established concern.

The old rule that "You can't get something for nothing" applies especially to air-conditioning. However, there is nothing for which one can get better returns for money invested than a properly-designed and installed air-conditioning system in a telephone exchange.

Before buying air-conditioning of any type, one should first make certain that all factors of design are carefully considered from every angle. The air-conditioning engineer may use some mysterious-sounding terms and phrases but, as a matter of fact, they are all very simple if given a brief preliminary study. There are two ways of rating the capacity of refrigerating machinery. The common unit in commercial ice plants is the "ton." This is the equivalent of freezing a ton of water, at freezing temperature, in 24 hours. Conversely, it is the amount of cold released by melting a ton of ice at 32 degrees Fahr. into water, also at 32 degrees Fahr., in 24 hours.

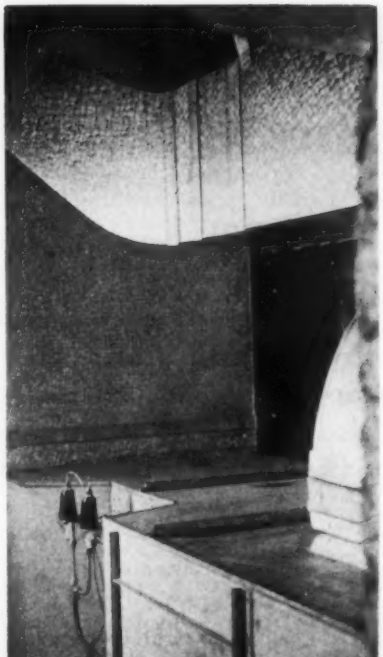
This unit has long been used in ice plants with success, but for air-conditioning work, where the freezing of ice is not involved, ratings stated in British thermal units per hour are less liable to be misinterpreted. One B T U is the amount of heat, or cold, necessary to change the temperature of a pound of water one degree Fahr., and 12,000 B T U per hour equals one ton of refrigeration. The fan is rated in C. F. M., which is the cubic feet of air which it can move per minute.

The difference between the outside temperature and the inside temperature is called "temperature difference." The approved practice of the American Society of Heating and Ventilating Engineers is to design an air-conditioning system that will maintain a temperature difference of 12 to 18 degrees, depending upon the purpose for which the conditioned area is to be used and also the occupation or degree of activity of the people who occupy it.

The inside temperature should never be too far below the outside temperature, as excessive temperature differences cause discomfort when passing from one to the other. Likewise, if the temperature difference is not as great as it should be, the results are also unsatisfactory.

The greater the temperature difference, the larger must be the equipment. This, in turn, means higher cost of operation. Extreme care should be exercised to so design a system that will give maximum comfort at minimum expense.

Relative humidity, or the percentage of moisture content of the air, is almost of equal importance to the low inside temperature. Control of relative humidity in the conditioned area is necessary and must be in balance with the inside temperature if the proper conditions are to be maintained. When the relative humidity is too high, or out of balance with the inside temperature, cold is prevalent and a feeling of discomfort will be noticed.



A View of the Evaporator Housing and Expansion Valves. The Tempering Coil Is Mounted at the Top of This Unit.

Proper moisture reduction must be provided in addition to a definite temperature control. The number of people who are to occupy the conditioned area, the work they perform and the length of time each day they will be in the conditioned area, should be carefully considered in the selection of equipment.

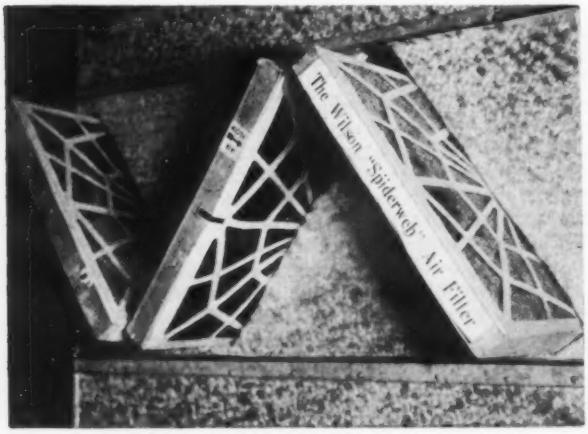
Fresh air from the outside is introduced into the conditioned area to remove odors, tobacco smoke, etc., and also to replace air which has been breathed and become vitiated. The volume of fresh air needed depends upon the number of occupants and the size of the conditioned area, and is measured in cubic feet per minute per person. It is usually considered necessary to provide from 1⅓ to four fresh-air changes per hour depending, of course, upon local conditions.

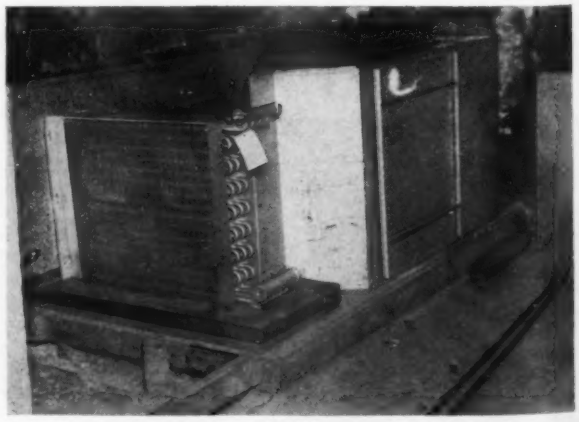
The decision as to the proper number of fresh-air changes is a very important item. If too little fresh air is introduced, it will result in a stale and stuffy condition. It must be remembered, however, that since all of the air must be cooled to the inside design temperature with the moisture content properly balanced—if more fresh air is introduced than necessary, it results in increased first cost and greatly increased operating costs.

The heat load through the walls, ceiling and floors, occupancy and ventilation, electric light and appliances such as rectifiers, must all be considered in a properly-designed system. Consideration must be taken as to the number of lights which will be used and the wattage consumed while the air-conditioning system is in operation, due to the amount of heat they will add to the conditioned area. The type of building, roof construction, and window details, also have a bearing.

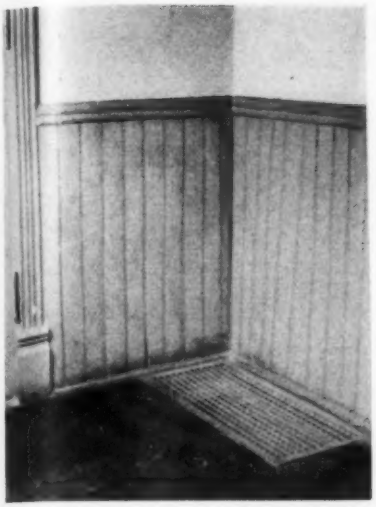
Double windows, or storm sash, are beneficial for summer cooling. They are a necessity in extremely cold climates, when winter humidification is used, to prevent moisture from the air from condensing upon the window panes and forming frost. Later when the frost melts the resulting moisture is apt to cause the window frames to swell and also to injure the decorations.

Double windows and storm doors





To the Left Are Seen the Air Filters. To the Right Is Seen Another View of the Evaporator Housing During Course of Construction



Return Air Vent in Floor of Plant Room.

are also beneficial in a telephone exchange, as they provide a more effective dust seal. Sun shining on glass, provides excessive heat transference and suitable awnings on exposed windows cause a considerable reduction in the operating cost of a cooling system.

A complete air-conditioning system for a telephone exchange should be designed to provide the following: Cooling, dehumidification, ventilation, air filtration, air distribution, winter humidification, and winter tempering.

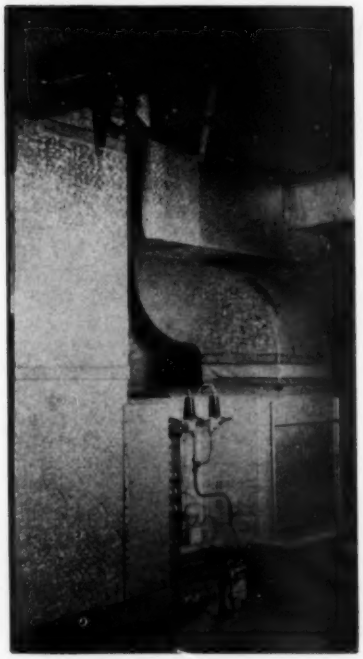
The location and climatic conditions will govern to a great extent the design temperatures and the following, which was successfully used in a certain telephone exchange, is given as a guide only:

Winter, outside temperature .....—10° Fahr.
Winter, inside temperature .....70° Fahr.
Winter, inside relative humidity .....40 Per cent
Summer, outside dry bulb .....95° Fahr.
Summer, outside wet bulb .....77° Fahr.
Summer, inside dry bulb .....80° Fahr.
Summer, inside wet bulb .....67° Fahr.
Summer, inside relative humidity .....50 Per cent

The dry-bulb temperature is usually taken with a liquid-in-glass type of thermometer, which simply indicates the temperature of the air. The wet-bulb temperature is taken with a similar type thermometer, except that its bulb is covered with cloth which can be wet. The evaporation of the water in this cloth causes a cooling effect and the moisture content of the air governs the rate of evaporation.

The sling type psychrometer—consisting of the wet and dry bulb thermometers attached to a board provided with a chain or string—which can be whirled rapidly, is generally used for taking room temperatures. This instrument provides that a much larger quantity of air is brought into contact with the thermometer bulbs.

In the particular telephone exchange mentioned, the area to be



Supply and Return Ducts Connected to Mixing Chamber and Evaporator Housing. Note Canvas Section in Supply Duct.

conditioned occupied 1,235 square feet with a 13,525 cubic foot air content and an occupancy of about 15 people. A total air circulation of 3,100 C. F. M. was specified, with 300 C. F. M. of outside air for ventilation. The conditioned air was released into each room in the following volume:

Business office .....1,150 C. F. M.
Switchboard room ...1,300 C. F. M.
Terminal room ..... 650 C. F. M.

Two types of cooling systems are now in common use—the unit system, and the duct or central system. Each type of system has its own particular advantages, depending upon the local requirements.

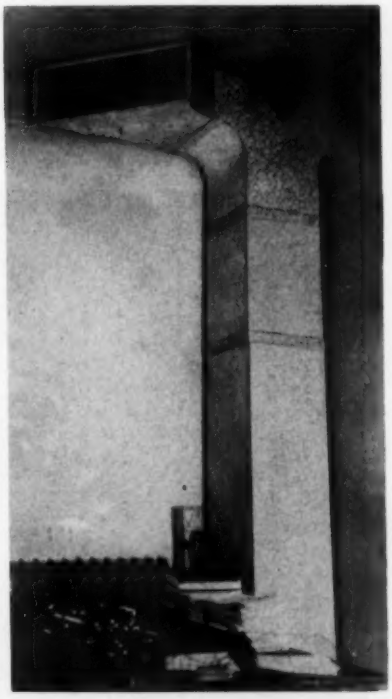
The unit system provides for one or more conditioners or units in each room. These units may consist either of the floor or suspended type, which are placed in the space to be cooled, and a "condensing unit" (motor-driven) which can be installed in the basement or other out-of-the-way location.

The conditioning units and the condensing unit are connected by two small copper pipes and by electric wires. The conditioning units are required to have a small drain for the surplus moisture which they take out of the air. The condensing unit also makes use of a water connection and drain when convenient, although air-cooled units are available.

The duct system is of the made-to-order type and must be designed according to the individual requirements of each job. A duct system may be designed to fit in with the decorating scheme of the area to be conditioned, although this additional expense is not ordinarily necessary or desirable in a telephone exchange.

The air ducts are usually constructed of galvanized iron, and the size depends upon the volume of air required. The mistake should never be made of constructing ducts too small in size, for experience over a period of years has proved that forcing a large volume of air through small ducts greatly increases noise.

For telephone exchanges, and especially the switchboard room, the ducts should be designed to carry the necessary volume of air



Fresh Air Duct and Outlet in Business Office; Branch Duct Supplies Fresh Air to Operating Room.

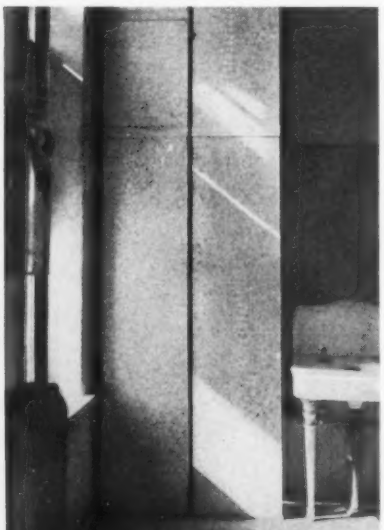
at a velocity which will hold the noise level to a minimum. With a duct system, the equipment is generally installed in the basement. Supply ducts carry the conditioned air to the various rooms and return ducts carry it back to the apparatus.

The supply ducts, which generally enter the rooms near the ceiling, are equipped with three-way directional grilles to provide equal distribution of air in the rooms and avoid draughts. The return air ducts are equipped with square mesh grilles and are installed either in the floor or in the wall near the floor level.

An effort will now be made to explain briefly how each part of the apparatus functions in supplying conditioned air for circulation through the duct system. The cooling of the air is produced on the same principle as in the ordinary ice plant or electric refrigerator.

A suitable gas—non-poisonous, non-irritant, non-inflammable and manufactured especially for this purpose—is compressed and cooled in the "condensing unit" until it becomes liquid. Pipes then conduct it to the air-conditioning unit, where it is allowed to expand and evaporate in the cooling coils, absorbing the heat from the surrounding air as it does so.

It then returns as a gas to the "condensing unit" where it is compressed, cooled, liquefied and sent out again. The condensing unit or compressor is generally driven by an electric motor of a type depending upon the commercial power available. The motor may be direct-connected to the compressor or the latter belt-driven by it.

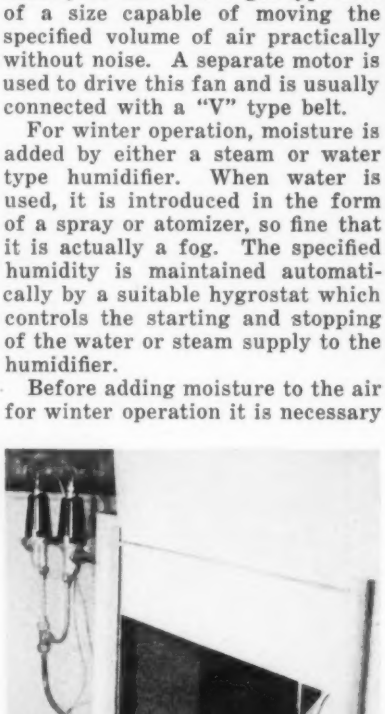


Main Supply and Return Air Ducts.

The compressor on a system of this type is generally water-cooled. The pipe connections between the air-conditioning and condensing units are of seamless copper with soldered connections. The fan is usually of the centrifugal type and of a size capable of moving the specified volume of air practically without noise. A separate motor is used to drive this fan and is usually connected with a "V" type belt.

For winter operation, moisture is added by either a steam or water type humidifier. When water is used, it is introduced in the form of a spray or atomizer, so fine that it is actually a fog. The specified humidity is maintained automatically by a suitable hygrostat which controls the starting and stopping of the water or steam supply to the humidifier.

Before adding moisture to the air for winter operation it is necessary



Air Fan Installed In Evaporator Housing.

that the fresh air first be tempered or heated. A heating coil is provided which is very similar to an automobile radiator, and is heated either by water or steam. After the fresh air supply for ventilation has been drawn through this coil and heated, moisture is added; the air is then circulated through the ducts.

Air drawn from the fresh-air vent and circulated through the rooms, contains dust which must be filtered out. Air filters are of two different types—those which can be cleaned, and those which must be thrown away when they become dust-laden. One type of filter is made of glass wool, packed in a suitable container. The glass wool is covered with an abhesive coating, the purpose of which is to catch dust from the air as it passes through.

Other filters are filled with hog

View of Air Ducts on Ceiling.

bristles which utilize the principle of dust impact on a viscous odorless wax for their operation. A good filter should have a dust-removing efficiency of 96 to 98 per cent. It should also be efficient in the removal of harmful and objectionable impurities in the air, such as dirt, pollen, bacteria, etc.

Good filters should also be effective over a considerable range of air velocities: they should have a low frictional resistance to air flow and large dust-holding capacities without excessive increase in resistance. They should be of the throw-away type, or of a type easy to clean and handle.

The air-filters, evaporators, moisture eliminators, heating coil and fan are located in a sheet metal enclosure, designated as the evaporator housing. The cooling coil should rest on a galvanized iron or copper drip pan with a drain connection to carry away condensation and also excess moisture from the humidifier. The necessary steam jets or spray nozzles are located between the heating and cooling coils.

The equipment housing should be provided with doors wherever necessary, to inspect moving parts or to oil the machinery. The discharge connection between the fan and supply duct should be equipped with a canvas section to eliminate vibration and noise in the rooms conditioned.

The return air and fresh-air ducts should discharge into a mixing chamber, which is a part of the housing, before entering the filters and cooling coil. The fresh-air in-

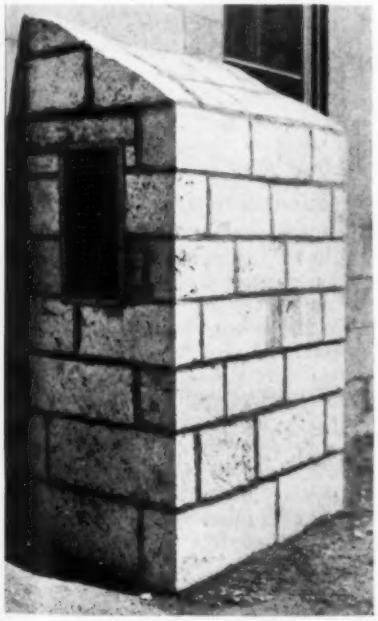
take should be equipped with adjustable louvers in order that the fresh-air supply can be controlled at all times.

After the air-conditioning plant described in this article had been placed in operation we found that, with the air intake set in a basement window, dust rolled right in on windy days and loaded the filters. To overcome this objectionable feature, we had constructed a stone "chimney" about six feet high, into the side of which we placed the air intake. As may be seen in the accompanying illustration, it was designed to harmonize with the walls of the building.

Not only is the air intake raised some four feet from the ground but with the opening on the side of the chimney, it is to a considerable degree sheltered from direct draughts of air. This we believe will do the trick.

Much less fresh air will usually be required in cold winter weather. The air mixture passes through the filters and into the evaporators where in summer it is cooled and dehumidified. Suspended moisture is removed from the air as it passes over the eliminator plates in its passage to the fan. The fan forces the air into the supply ducts which carry it to the rooms to be conditioned.

Ordinarily, for summer operation about 15 to 25 cubic feet of outside air per person is cleansed and introduced into the duct system each minute. The remainder of the air volume is recirculated or leaks away as no building can be entirely sealed.



The Fresh Air Intake to the Air-Conditioning Unit in the Basement of the Telephone Exchange, Was Placed in the Side of This Stone "Chimney," to Prevent Surface Dirt from Being Drawn Into the System and Loading the Filters, Especially During High Winds.

One duplex thermostat, designed for both summer and winter operation, should be mounted in the most desirable location in the area to be conditioned. In a telephone exchange, this is usually the switchboard room, for it is occupied the full 24 hours each day.

In summer this thermostat will control the compressor according to variations in room temperatures. In winter this same thermostat will control the automatic starter on the fan in accordance with changes in room temperature. Humidity control will be maintained by means of a hygrostat placed in one of the rooms to control a solenoid valve on the water or steam line to the humidifiers.

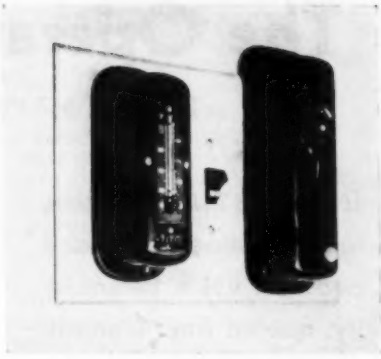
The cost of operation will depend entirely upon local conditions but when the benefit obtained is considered, the cost will be found to be of secondary importance. The system installed in the telephone exchange previously mentioned makes use of a 7½ H. P. compressor motor and a ½ H. P. fan motor, both of which are three-phase.

This system is designed so that the fan is permitted to run continuously. The compressor, under control of the thermostat, will run about 50 per cent of the time. From this it can be readily seen that the cost of current at the usual power rate is not excessive.

The compressor requires a maximum of 330 gallons of 65 degree Fahr. condenser water per hour, for continuous operation. An arrangement can generally be devised to make use of this water to sprinkle lawns after it passes through the compressor, if desired. When tap water at a temperature of 55 degress Fahr., or cooler, can be obtained, some economy can probably be realized by utilizing this water to pre-cool the air before circulating it through the conditioning unit.

A reliable contractor is always willing to guarantee all material and equipment furnished to be free from inherent defects. Should any such defects occur, replacement will be made without cost for a period of one year after installation of the equipment.

This guarantee should also include any necessary replacement of gas for a period of one year, if the fault lies with the contractor, or is the result of inherent defects of equipment. After the first year the service cost of a properly-installed and maintained system should be extremely small.



Automatic Control Instruments Mounted in Switchboard Room.

In this article the writer has attempted to give a brief description of an air-conditioning system suitable for the average telephone exchange. Volumes could be written on this important subject, although it is not believed that many of the minor details would be of interest to anyone except, perhaps, a designing engineer.

The writer firmly believes that air-conditioning is one of the greatest improvements made available for use in the telephone exchange during the past 30 years.

While the greatest benefit, perhaps, is enjoyed in regions subjected to heavy dust storms, there is no place on the face of the globe where telephone exchanges are operated that air-conditioning systems can not be used to advantage and prove a worthwhile investment.

Someone has said that "Happiness is the presence of pleasure and the absence of pain." Complete happiness to a telephone man, in the writer's opinion, means the absence of dust and the presence of an abundance of good, clean air of the proper moisture content, circulated through the telephone exchange. And this is now possible by means of modern air-conditioning.

▼ ▼

Bell in Wisconsin Pays Income Tax

The Wisconsin Telephone Co. recently paid to the state treasurer $52,222.58 income tax assessed for 1935. It is the first income tax ever paid by the telephone company to the state.

The tax was levied not only on state business of the company but on income from interstate business arising in Wisconsin.

The Operators' Corner

By MRS. MAYME WORKMAN

Traffic Supervisor, The Illinois Telephone Association, Springfield, Ill.

INTERESTING article, incorporating value and need for voice personality, quoted from Canadian Telephone Journal. Series No. 237

"WHY do we hear so much about voice work?" was a query put to the writer in the traffic conference at the annual state convention of The Texas Telephone Association held recently in Dallas. Voice work plays a vital part in the operator's work of serving the public since she must depend entirely upon her tone of voice to convey courtesy and a willingness to please. Therefore, it behooves every telephone operator to cultivate a pleasing voice personality.

A very interesting article bearing out the foregoing statement appeared recently in The Canadian Telephone Journal under the caption "600 'Hello Girls' Sought in London" and is quoted as follows:

"Six hundred girls with clear, unaffected voices, deft fingers and quick brains recently were sought by the General Post Office to train as London telephone operators. More girls are needed in the English provinces, says the London Sunday Express. This is because of the growth of the telephone habit in Britain. Two million more calls per week have to be handled now than in 1934, and a greater increase is expected.

The girls must be of secondary school education, between 16 and 19, at least five feet tall — their arms must be able to reach about the switchboards—and *no Oxford accents.* They begin at a salary of 29 shillings a week, rising at 21 years of age to 46 shillings a week, and then to three pounds one shilling per week, with prospects of still further promotion.

'Their voices,' said a Post Office official, 'should be attractive but not affected. Oxford accents are certainly not desired. The girls should speak clearly, distinctly, and with personality, if possible. Straight and simple speaking is the first essential. We find London girls speak best.

'Voices should be modeled as closely as possible with that of the girl with the "golden voice" of the Post Office—Miss Ethel Cain. She is a London girl. Gramophone records of her voice have been sent to all our telephone schools in the kingdom.

The new girls—who will be paid during their period of training—will be interviewed by the chief woman supervisor and given voice tests.

The marriage toll on exchanges is heavy (all operators please note that voices attract the masculine sex). The majority of girls do not serve more than seven years before leaving to marry. Many men are more attracted by a nice voice than by a pretty face. We train these girls to a high pitch of efficiency and prepare wonderful-speaking wives for the husbands of the future.

We can't find enough recruits to fill the vacancies for girl telephonists. All those displaced from automatic exchanges have been easily absorbed. In the last year 400 have been absorbed in this way, but, in spite of that, it has been necessary to engage nearly 1,000 additional girls?' "

So we in the United States are not alone in our efforts to develop pleasing voice personalities.

Questions from Illinois Operators

1. In changing ticket directions, if the calling party specifies another party at a different telephone in one order, how do you proceed?
2. What action is taken if a customer makes repeated attempts to take advantage of the practice provided for locating a called party in various cities for the purpose of obtaining information contained in the reports without paying for a completed call?
3. What procedure is followed by the supervisor in a case of this kind?
4. How many times should you ring a party on a long distance call before you tell them they do not answer?
5. What effect will a worn jack have on a connection?

For the answers to these traffic questions, please turn to page 48.

Flashes and Plugs — News Briefs and Comments

The telephone bill for the United States Senate runs between $2,000 and $3,000 a month.

* *

According to a magazine's survey, telephone operators prefer to give service to male callers. The Bell reports that it employs 107,000 operators in the United States and that there are 145,000 operators running private switchboards.

* *

Dr. Jas. F. Baldwin, of Columbus, Ohio, who died recently, held the record for being the longest continuous user of telephone service in the state. His telephone was connected in 1879.

* *

Forty-four additional telephone lines were installed at Garnisch-Partenkirchen, Germany, for the Olympic games. Two thousand long distance calls were made daily.

* *

The Royal Institute of British Architects recommend that all new apartments and homes be wired for television. Dr. Lee De Forest predicts television will be available in two years.

* *

Business recovery signs most frequently cited are increased use of the telephone and increased automobile sales. The reason given is that as people grow more cheerful they want to move around more and talk to one another. Hence, more cars and more telephones.

* *

New York authorities have seized a ton of counterfeit telephone slugs which were used by racketeers in the metropolitan district. The racket is said to cost the telephone company a million dollars a year.

* *

Over long distance telephone lines between Nassau, in the Bahama Islands, and Hollywood, Calif., Irving Berlin heard the rehearsal of his songs written for the film "Follow the Fleet."

* *

Among the items in the list of expenses for the present session of Congress is $90,000 for telephone service.

* *

It is estimated that New Yorkers spend an average of $3,000 a day in telephoning for the correct time.

* *

The only country in the world without telephones is the tiny republic of Andorra which lies between France and Spain. These two nations can't agree which shall supply the service.

Plant Men "Swap" Ideas

Michigan Bell Solves Difficult Cable Problem

A BIG JOB was created for the plant department of the Michigan Bell Telephone Co. not long ago when the city of Sault St. Marie announced the completion of plans for the construction (with the aid of the Michigan State Highway Department) of a new bridge across the state's largest power canal, in order to modernize and widen the community's principal highway entrance.

According to the story related in a recent issue of The Michigan Bell, the power canal of the Union Carbide Co. at Sault St. Marie, stretches about five miles east and west, joining the upper St. Mary's river, at the foot of Lake Superior, with the lower river, just east of the principal business section, and makes an island of a large portion of this northern metropolis.

It is a wide canal, so deep that it carries blue water, and has a current speed of 22 miles per hour. The new bridge, now completed, spans the canal in the southern portion of the city's business section, and carries thousands of vehicles daily, not only local traffic, but also the great flow of cars into that city from south, east and west.

The telephone company's cables were carried by the old bridge, a light iron structure built about 35 years ago, and it became necessary to remove them, suspend them temporarily across the canal while the new structure was being erected, and then to place them in fiber ducts on the new bridge. There are two 900-pair exchange cables and one toll cable of 154 quads.

The span of more than 250 feet through the air necessitated heavy guying at both ends, five 16-M and two 10-M guys being used at each end. During the course of temporary cable work and before the new cable could be pulled through the fiber ducts, it also was necessary to lay 266 feet of underground cable, under difficult conditions that were the result of the bridge and highway approach construction.

Because of the height at which the temporary cable had to be suspended, the depth of the water and the swiftness of the current, lifelines were attached to the men who were required to work on the aerial strand which was to carry the cable. These lines were attended by other employes, stationed on the steep banks of the stream.

Every possible precaution to prevent injury or accident was taken. Foreman M. H. Smith of the Michigan Bell Telephone Co., acted as supervisor of the job, which was handled by the northern division construction department, with the assistance of the local and area exchange plant people.

The following men had a part in the work: I. D. Trondsen, division construction superintendent; Line Foreman M. H. Smith; Linemen Ejner H. Anderson, Eric O. Anderson, Eston C. Comstock, Sever Karvala, and Roy Sivertsen; Truck Driver Arthur T. Grant; L. V. Beauden, division splicing foreman; Splicer G. DeLase; Helper C. Mathews.

▼ ▼

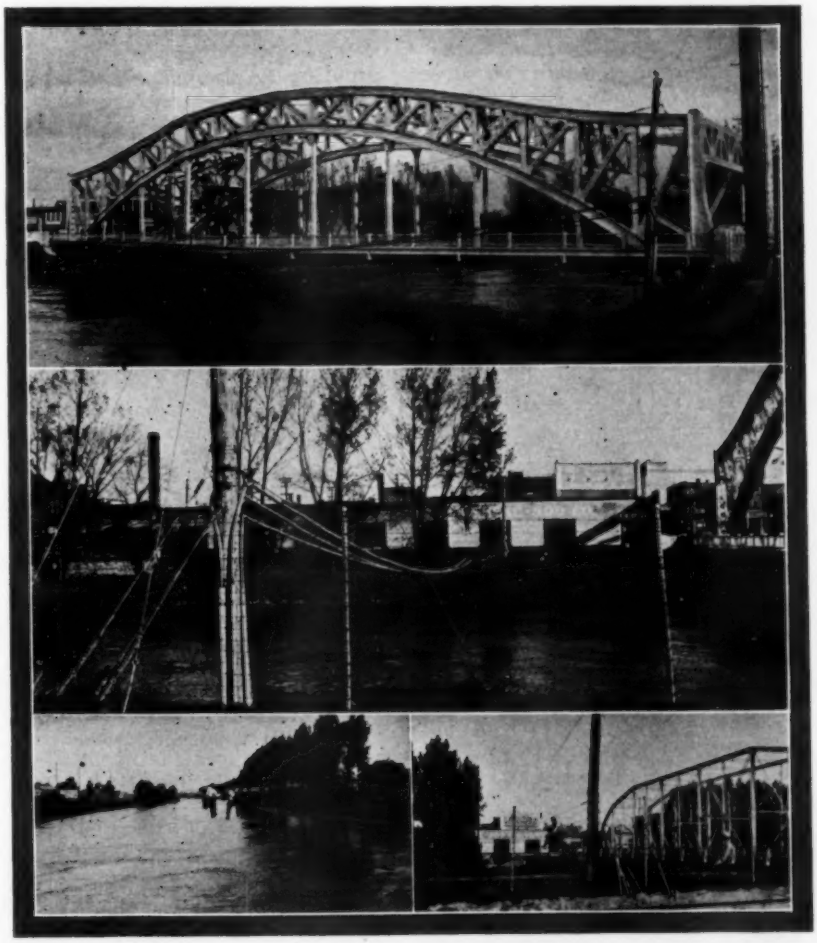
Some Telephone Things I Didn't Know Until Now

By Oscar Will Tell

That a special solder with a stearine (stearic-acid) core has been developed for use in running the seam on a split sleeve in cable splicing.

That a special fibre washer is now being used on screws which fasten protectors or telephones on slightly damp walls. The washers hold the telephone or protector away from the wall.

That Admiral Byrd in speaking of his return to Little America in "Antarctic Night" said: "It wouldn't be right to say that the place looked as if we had left it only yesterday. The roof had sagged under the crushing weight of ice. A film of ice lay over the walls. Torn parkas, unmatched mukluks, dirty underwear were scattered about. I was a trifle ashamed that we had left that mess behind us, but glad we could do our own housecleaning.



These Views Show Temporary Cable Bridge Built So the New Sault St. Marie Highway Bridge Could Be Constructed as Shown at the Top. Center, Two 900-Pair Exchange Cables and a Toll Cable of 154 Quads Temporarily Suspended Across the 250-Foot Power Canal so Telephone Service Would Not Be Interrupted During the Bridge Construction. Bottom, Linemen Roy Sivertsen and Eric Anderson Placing Rings on the Strand to Hold the Cable. The Current Below Them Sweeps Along at 22 Miles Per Hour and, for Safety, Each is Connected With the Shore by Means of a Lifeline. On the Right is Shown a View of the Old Bridge. Eric Anderson is Out on the Strand Placing Cable Rings With Ejner Anderson on Shore Holding the Lifeline.

"While we were standing there the telephone rang. I'm not joking; it actually rang. If Haile Selassie had crawled out from under one of the bunks, we couldn't have been more taken aback. Nobody moved for a second. Then we heard Petersen laugh. He had found the telephone and pressed the buzzer."

▼ ▼

The Revometer— Saver of Shoe Leather

By NORMAN POWNE
District Plant Engineer,
West Coast Telephone Co., Forest Grove, Ore.

THERE is an old saw to the effect that "necessity is the mother of invention." I am convinced that personal comfort is a strong factor to the same end.

It was one of those scorching summer days in the upper Sacramento Valley in mid-northern California, with the thermometer standing at 110 degrees in the shade—and the nearest shade no closer than the redwoods a hundred miles to the west beyond the Coast Range. Not a breath of air was stirring to temper the heat; one simply sat and simmered in his own perspiration.

The job before us was to "lay out" a three-mile suburban line extension. The prospect of pacing pole spans for three miles and then trudging three miles back to the car under that fiery sun, turned one's mind to visions of the "ole swimmin' hole."

Right there the idea was born! Undoubtedly, it was not a new wrinkle, for I have since learned that some of the old timers were wont to tie a rag about the rim or spoke of the buggy wheel for the same purpose. However, in the ten years since that day, I have not seen or heard of the scheme being used. So, in hopes of saving time, effort and shoe leather for others, I'm passing the idea along for what it is worth.

A sliver of wood 12 to 15 inches in length and a tape measure are the only requisites. A notch, the size of the valve stem, is whittled into the stick an inch or so from the butt end. The opposite end is tapered to lighten it. The stick is then clamped under the rim nut of the valve stem on the left front wheel of the car and projecting at right angles from the wheel.

By sitting on the extreme left side of the driver's seat and spreading your vision somewhat, it is an easy matter to watch the road and at the same time count the revolutions of the wheel, as indicated by the pointer which projects well beyond the fender.

The pointer may be as simple or as elaborate as you wish to make it. I have used a sliver from a fence post, a piece split from a surveyor's stake, or a bit of cedar shingle. One made of metal, properly drilled to fit the valve stem and painted white for better visibility, would be much more satisfactory.

To determine the circumference of the wheel, move the car until the pointer is at its lowest point. Make a mark on the roadway, or if alone, pinion one end of the tape to the ground with a screw driver. Then drive ahead in a straight line until ten revolutions of the wheel have been made and the pointer is again at its lowest point. A tenth of the distance measured between the two points gives the average circumference of the wheel.

With this determined, its application becomes simply a matter of counting revolutions over the distance to be measured and then, or later, converting these revolutions to feet. Some practice will undoubtedly be required before full proficiency in the use of the scheme is attained. The following comments may prove helpful to those who determine to try it out.

In operation, the car is stopped with the driver's seat opposite the beginning point of the course to be measured. Usually there is a roadside ditch between the car and the line of the lead so that the course of the measuring wheel is offset from the line of the lead by an appreciable distance. Accuracy then depends on making your readings each time from a certain point on the car when it is opposite the point on the course, at right angles to the course. This can most accurately be determined by choosing a point opposite the seat.

Next, note the position of the pointer, whether it be at top, bottom, front or back position about the circumference of the wheel. For most purposes, reading to the nearest quarter revolution is sufficiently accurate, as on most cars an eighth turn will amount to less than one foot.

In counting the revolutions of the wheel, it will avoid confusion to count each turn as the pointer passes the quarter point at which it stood when the run was started. That is, if the pointer stood at the top of the wheel at the start, then count each turn as the pointer passes the top position. Suppose the wheel makes 20 complete revolutions and the pointer carries to the bottom position. Then the length of the course is 20½ revolutions. If continuing on to measure the next span, the count would be made as the pointer passes the bottom position.

Inflation of the tire and wear of the tread will naturally make some difference in the circumference of the wheel, so that it is well to occasionally check the circumference.

Uneven or rough road surface will have some small effect on the accuracy of the measurements. However, all things considered, the revometer will be found quite accurate, enough for all ordinary requirements. The percentage of error should not exceed 2 per cent in working on tangents.

Curves, of course, are another matter. The degree of curvature and the separation between wheel track and line of lead will determine the amount of error. For ordinary work on slight curves, a correction may be estimated, but on sharp curves it is best to revert to the tape or pacing.

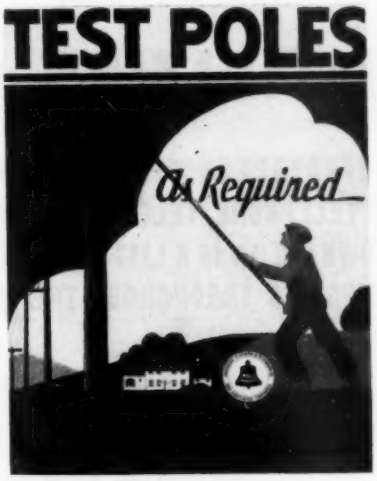
In the few years the scheme has been used, I have found a number of applications for it and have counted off many a mile. It is especially useful in making accurate preliminary estimates of costs for pole line and wire extensions or rebuilds.

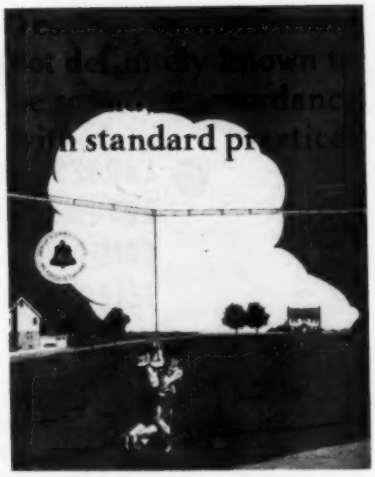
The laying out and staking of suburban pole lines is greatly expedited by using the revometer. There are certain places where poles must be located, such as at the beginning or end of curves, at corners, etc. On the intermediate stretches, measure the total distance, divide by the normal span length and find the nearest number of spans in the section. Then divide the number of spans into the total distance to get the average span for the particular section. Convert this into revolutions and return over the course and drop stakes accordingly.

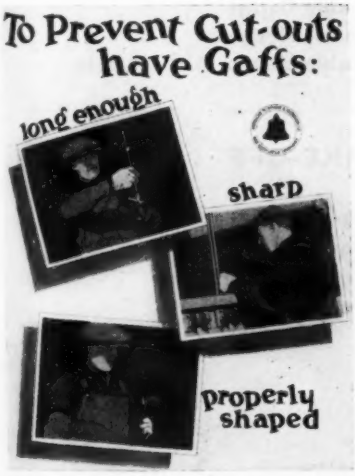
In the past five years we have taken over a number of long suburban lines which had been constructed in ignorance of power induction and transposition schemes. It is a simple matter to run out over one of these lines and jot down the span lengths in revolutions, along with other pertinent data required in preparing a plan for properly transposing the circuits. With a little work in the office converting the revolutions to feet, a scheme of transpositions is soon ready for use.

In closing, just a word of warning. Glance occasionally in the rear view mirror to avoid being bumped from the rear.

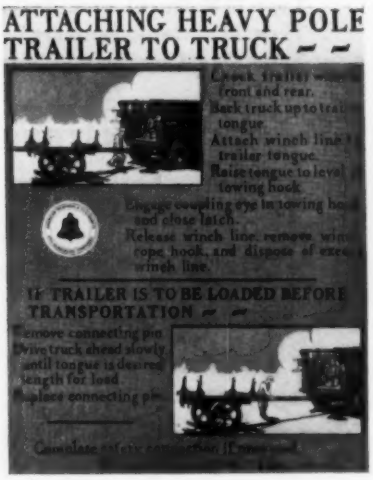
SOME SAFETY PRACTICES

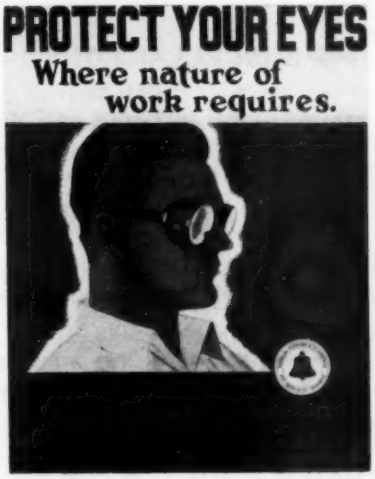


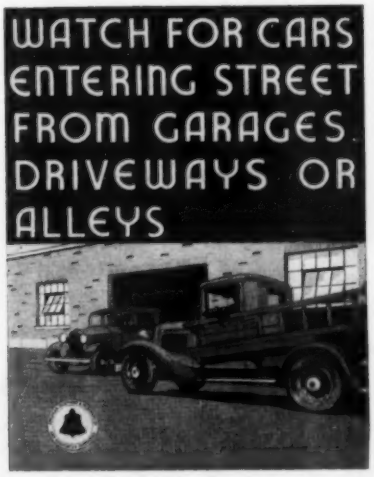




To Prevent Cut-outs
Jab gaffs well into pole. Avoid cracks and knots. Do not place gaffs immediately above unused gains and old gaff marks







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Type LIU Light Installation
Type SL Section Lineman's
Type CS Cable Splicer
Tyye 3119 Rural Installation
Type 3424 Cable Splicers
Type 3278 Telephone Service

➔WINCHES

Type A-100 Single Drum
Type B-100 Single Drum
Type A-250 Single Drum
Type A-350 CB Single Drum, with clutch
Type A-626 B Double Drum
Type A-1626CB Double Drum
Type A-1626CB Double Drum, with clutch

➔LINE CONSTRUCTION BODIES

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Type HT Telegraph
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Type H.P.L. 7-Man Cab
Type LC Medium Duty
Type LCW Heavy Duty

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Type 2000 Single Power Drive
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Type XLM Extra Light Duty
Type LM Light Duty
Type HM Heavy Duty
Type T Heavy Duty

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Engineering the Telephone Fleet

By T. C. SMITH

SOME FACTORS entering into the design of various types of motor vehicles which make up the Bell System's fleet of 17,000 motor cars and trucks. Carefully-selected chassis, built in quantity and secured at reasonable price, form bases for various units. Light aluminum alloy or galvanized steel used in body construction enable vehicles to carry heavier loads. Each class is designed for the type of service in which it will be used. Published through courtesy of Bell Telephone Quarterly

WITH A FLEET of some 17,000 cars and trucks in service throughout the country, the Bell System requires annually a large number of motor vehicles for replacements alone. While full advantage is taken of advances in design which are developed within the automotive industry, the great majority of bodies and associated equipment for the vehicles purchased are designed by Bell System engineers.

In this large portion of the fleet are the vehicles ranging in capacities from one-half ton to ten tons which transport workmen incidental to their general functions of gang construction and maintenance work.

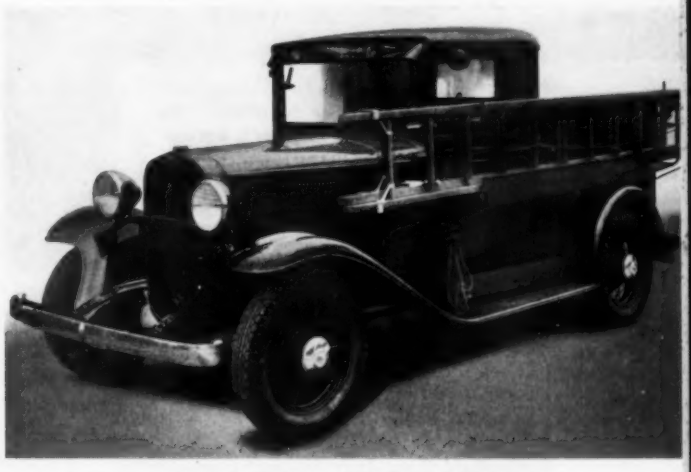
As the first step in providing proper vehicles for telephone work in either the commercially available or specialized group, chassis are selected for each individual kind of service, with regard to carrying capacity, performance characteristics and size. In addition, consideration is given to the first cost and the economy of operation of the chassis as well as service facilities available.

This carefully-selected type of chassis, which is ordinarily built in quantity and thus can be secured at a reasonable price, is the foundation for the proposed unit of the telephone fleet. A satisfactory type of chassis is usually available in more than one make, so that there is provided a choice in various parts of the country to meet local conditions of service.

For the cases where special body equipment is required, there is at the present time a sufficient standardization of chassis dimensions so that one design of body can be made which can be adapted, with minor modifications, to several makes of chassis.

The vehicle manufacturers generally have developed cabs which fit their chassis and are suitable for use with practically any type of body that it may be desired to mount back of them. These cabs also are produced in quantity at very reasonable prices.

Having secured the chassis and cab suitable for the job in question, a specially-adapted body—together with accessory power devices and other equipment applicable to the particular type of work—are added to provide the complete telephone vehicle. Depending upon the class of work for which the vehicle is ex-



This Half-Ton Truck, Known as the Type "LI" Vehicle, Serves Installers and Their Helpers.

Rear View of the LI Body. About 1,300 of these Bodies Are Purchased Annually by the Bell Companies.

pected to be used, the accessory equipment may include such items as a power winch, pole derrick, collapsible power reel, power pump, air compressor, towing hook, etc.

It is the purpose of this paper to discuss some of the factors entering into the design of various types of telephone truck bodies. The accessory power equipment will not be discussed in detail.

In the work of the telephone engineers first consideration is always given to factors of utility, cost, maintenance, and safety, while adding—insofar as practicable—features which have to do more with appearance. Much has been accomplished by the manufacturers in providing lower chassis designs, with greatly improved radiator, lamp, hood, cowl and cab appearance, as compared with those available a few years ago. While holding fast to maximum utility, the appearance of the telephone body designs has kept in step with the rapid improvements which have been made throughout the automotive industry.

The RI Type of Vehicle, a Commercial Panel Type, Used by Installer Repairmen, with Specially - Designed Interior Fittings.

To the Left Is the MC Type Vehicle, a Medium Duty Construction and Maintenance Truck

Half-Ton Installation Car

One of the generally-used units in telephone service is the one-half-ton installation car in the "LI" classification, which serves the installers and their helpers in connecting, moving, and removing the telephone sets and the associated wire to and upon the subscribers' premises. At the present rate of about 1,300 LI bodies purchased a year, the production has reached sufficient quantities to warrant the use of such manufacturing equipment as to result in low cost, high quality and uniformity in the units.

For these and most of the other bodies which are fabricated from sheet metal, a type of sheet is used which is protected from rusting by very thin smooth coats of zinc forming what is termed a galvannealed surface. With such material, even though the paint on the outside of the body is ruptured, there is very little tendency for rust to form and undermine the adjacent painted surfaces. Thus the galvannealed material improves the appearance and increases the life of the body.

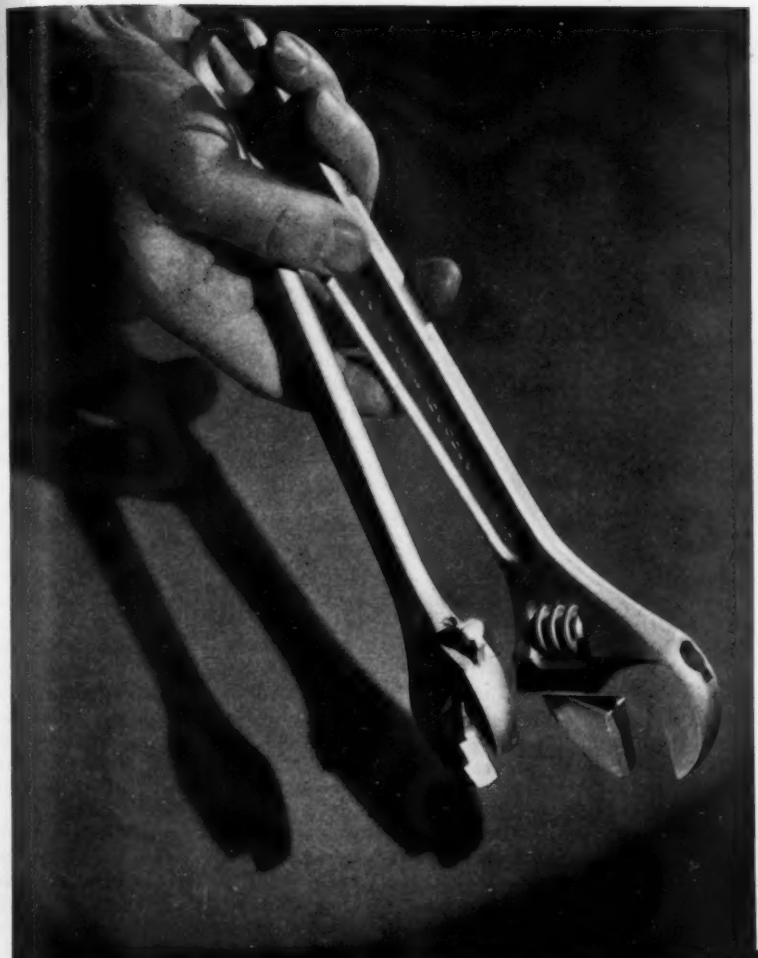
The roof, drawers, doors and various other parts of the body are formed in large presses with suitable dies and jigs, to expedite the work and to insure good fits between fabricated parts as well as between drawers and their guides. Throughout the construction, spot welding is used very generally, with only a small number of rivets at strategic locations.

Strong ladder brackets are provided for use at the side of the LI body to carry the extension ladders which are ordinarily used by installers. Quick-acting fasteners are used to secure the ladders in place while in transit.

This Type Truck, Designated as SL, Is Used by the Section Lineman and Installer-Repairmen.

Practically every item of equipment, both tools and materials, which an installer ordinarily uses is assigned its properly-located compartment in the body. Provision is made for carrying all sizes and types of telephone instruments and subscriber sets in such a manner that they are easily placed in

To the Left Is a Rear View of the SL Body; the Roof Is Designed for Carrying Brush or Bulky Materials Used in Repair Work. To the Right Is a Rear View of the RI Type Vehicle; to Save Weight for Pay Load, These Interior Fittings Are of Aluminum Alloy



Modern WRENCHES *for Better* LINEWORK

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THESE modern adjustable wrenches with their lean symmetry, better balance and extraordinary strength are ideal for linemen.

Forged from *Crestoloy* steel, they are one-third thinner than ordinary adjustable wrenches, yet actually more than *twice* as strong. A 10 inch wrench with a capacity opening of 1 1/8 inches weighs less than 13 ounces —adds little to the weight of a lineman's belt.

All Crestoloy Wrenches are heavily chrome-plated—heads polished bright and handles specially finished to provide maximum "traction" even when hands are wet or oily. Seven sizes from 4 to 24 inches. Ask your supply house or write for the New Crescent Catalog of guaranteed hand tools.

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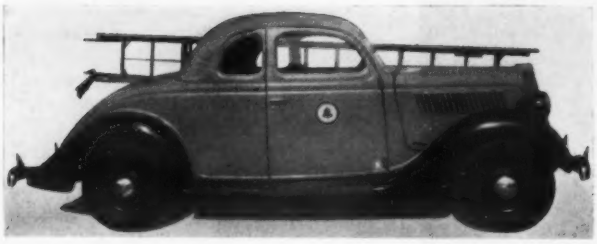


The R Type Vehicle Is Used by the Single Repairman Who Has to Cover Considerable Territory. The Type CS Truck, Shown to the Right, Is Used by the Splicer-Repairman; the Body Is Fabricated of Aluminum Alloy to Permit of a Large Body on a Small Chassis.

and removed from the body and so that they will not be damaged in transportation even though in isolated cases particular instruments may be carried several days.

The materials are so arranged in the body that those which are associated are grouped together and those most frequently used are most readily accessible. Some idea of the amount of detail represented in the design of the body is obtained when it is realized that in this one body there are incorporated about 125 drawer spaces, racks, tool holders and compartments. All of the items of equipment are carried, protected from the weather, in these conveniently accessible compartments, in a body which is quite low in price for the facilities provided.

The entire unit is painted in the standard telephone color, providing a very presentable type of vehicle for the use of the thousands of Bell System installers in their very large number of customer contacts.

There are other types of bodies having somewhat the same general appearance as the LI installation body just mentioned, but which are necessarily entirely different in compartment space and interior design to adapt them to other classes of service. One such unit is known as the type "SL" body, for use of section linemen and installer-repairmen.

In addition to the suitable compartment spaces within the body, this unit has a strongly-built roof with sides and a front rail and also rope loops, providing facilities for carrying brush during tree trimming work, or bulky materials which might be required in connection with repair work. A unit of this type equipped with a light towing hook at the rear can also be used where desired in isolated territories to haul light trailers carrying poles or coils of wire.

Aluminum Alloy Body To Increase Load Capacity

Yet another vehicle of the general type of the LI unit is the splicer-repairman body, which is known as the "CS" unit. Because of the volume of tools and equipment required by this type of gang, the CS body is larger than either of the two previously mentioned.

The weight of materials and tools, such as tanks of nitrogen gas and lead sleeves, which have to be carried, is so great that in order to keep within the normal carrying capacity of light commercial chassis it has been found desirable to fabricate the body and its equipment from a very light aluminum alloy. By so doing, several hundred pounds in weight are saved as compared with similar steel bodies, which, of course, can be added to the net pay load.

It may be of interest to note that when this body was designed it was evident that, in order to make its manufacture practicable, it would be very desirable to fabricate the material by spot welding the aluminum alloy parts rather than by riveting them.

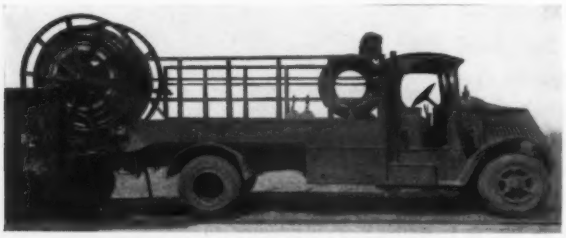
In order to make this possible, it was necessary for the body builders to inaugurate new manufacturing practices and provide suitable welding equipment. After some experimenting and testing, this new practice is working out very satisfactory. Arc and gas welding were tried, but spot welding was found to be far superior for this work because of the better control of the welding heat.

While the use of aluminum in the body adds approximately 50 per cent to the cost of the finished product, there will be a somewhat greater recovery value when the units are finally disposed of. The use of a lighter, less expensive chassis is permitted. The aluminum alloy provides a painting surface which is free from rust chipping, similar to the result obtained with galvannealed steel surfaces.

As another general type of body design, in some cases very satisfactory results have been obtained through using light commercial panel trucks carrying specially designed inside equipment, as in the installer-repairman units known as the "RI" bodies.

In order to add as little as possible to the weight of the panel bodies—which in themselves are rather heavy—and thus provide the maximum carrying capacity, the interior work, which of necessity is quite extensive, is made of aluminum alloy.

Insofar as it is practicable, identical units such as the instrument carrying trays are used in the RI, SL and LI bodies in order to increase quantity production and reduce the cost of these units.



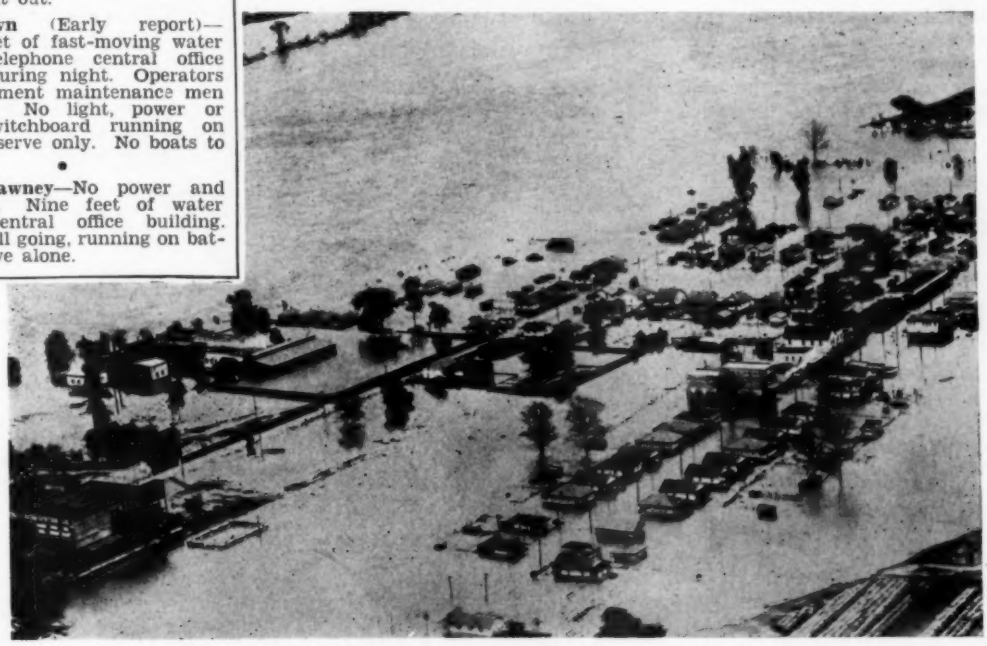
This M Type Vehicle Is a Heavy Duty Delivery Truck. The LCW Light Truck Has Ample Storage and Auxiliary Power Facilities to Serve Small Construction and Maintenance Gangs.

Heroic tales of telephone operators and maintenance men, marooned in office buildings until water crept up to switchboards, also came from the flooded areas. In many towns the only means of wire communication was kept up by reserve batteries after dynamo power went out.

Johnstown (Early report)—Twelve feet of fast-moving water around telephone central office building during night. Operators and equipment maintenance men marooned. No light, power or heat. Switchboard running on battery reserve only. No boats to be had.

•

Punxsutawney—No power and no steam. Nine feet of water around central office building. Service still going, running on battery reserve alone.



Our Public Servants In Times of Trouble

Too much praise cannot be given to the employees of telephone companies throughout the Nation's flooded areas. Time and time again they demonstrated their devotion to public service.

When Exide operating engineers hurried into the stricken communities to assist users of Exide Batteries, they saw hundreds of men and women who had stuck to their posts under almost unbelievable conditions. Day and night they had toiled heroically to maintain connections with the outside world, wherever that was possible. Bleary eyed and haggard these workers plainly showed the terrific strain under which they had labored, and the lack of several days' sleep.

It is interesting to know that in numerous instances Exide Batteries continued to deliver power, even though completely submerged; and, when the waters receded, they could be kept in service by merely recharging.

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Exide Batteries of Canada, Limited, Toronto

For a single repairman who has to do a considerable amount of traveling in connection with his work and requires only a limited quantity of tools and supplies, a type "R" unit is used. This consists of a business coupé having compartments, shelves, drawers, etc., specially adapted for carrying the required materials and tools, and fitted into the generous rear deck of the modern coupé. As with the LI, SL, CS and RI bodies already mentioned, the type R units are equipped with facilities for carrying an extension ladder clamped in supports at the side of the body.

Rear View of the Type R Body; Especially Designed Compartments Fit in the Rear Deck of the Coupe.

Advancing now to the heavier duty trucks, a broadly used type is represented by the new light pole line and cable construction and maintenance unit of the "LCW" classification. This unit represents the latest development in its class. It is now undergoing field trials and will very soon be available for all Bell System companies. The LCW unit is designed for the purpose of providing all of the desirable auxiliary power equipment, as well as many other facilities which are outlined herein.

Latest Development in Heavier Duty Class

By utilizing low-priced, large-production 1½-ton chassis and designing the bodies and other equipment to correspond, it has been possible to make available small gang trucks which have extreme flexibility and are especially well adapted to the work at a very low first cost and operating cost per unit.

The LCW bodies are built almost entirely of galvannealed steel, of gauges as light as practicable for various parts of the units. In the construction, welding is used extensively. However, the body is so designed that if it is necessary to ship it some distance from the point of manufacture, it can readily be disassembled into five parts, packed into a relatively small space for shipping, and then reassembled without difficulty.

In the design of this body special provision is made for mounting the power equipment conveniently for use and also for carrying it when not in service. For instance, a hinged steel seat covers the power winch which is located at the forward end of the body just back of the cab.

When the winch is not in service, this cover—with its sponge rubber cushion—provides a comfortable seat for those of the gang who are not accommodated in the cab. The seat can easily be hinged together into a flat section and raised above and to one side, leaving free access to the winch for pole derrick work, cable pulling, etc.

When the winch seat is down, the front of the body is entirely sealed against wind and weather, as are both sides and the top, so that the men riding upon the winch seat, as as well as the blocks and tackle, etc., are well protected.

As a new feature of considerable convenience, the roof on the LCW bodies is of a telescoping type, so designed that it can readily be pulled back to cover two-thirds of the entire body or, when the roof is not desired, it can be telescoped into a conveniently small space over the front of the unit. The steel plate floor of the body is of diamond grid design so that it presents a good non-skid surface.

As a first step in the design, representative lists of tools and materials to be carried by gangs of this type were studied carefully; then the side boxes, racks, compartments, shelves and partitions were so designed as to carry the proper amount of each class of equipment in a convenient, orderly manner.

This consideration is very important, particularly in a truck of this type where the carrying capacity is limited. The proper arrangement and size of carrying spaces permit a quick visual inventory of the materials and tools on the truck, thus obviating an overstock and overweight of some types of equipment and an undersupply of others.

Suitable lockers are provided for carrying the men's extra clothing and their lunches. Also, as a safety precaution, it should be noted that the facilities for carrying linemen's climbers, body belts and safety straps are such as to prevent damage to the leather by the climber gaffs. The various side- and under-boxes of the body can be secured with flush locks when desired.

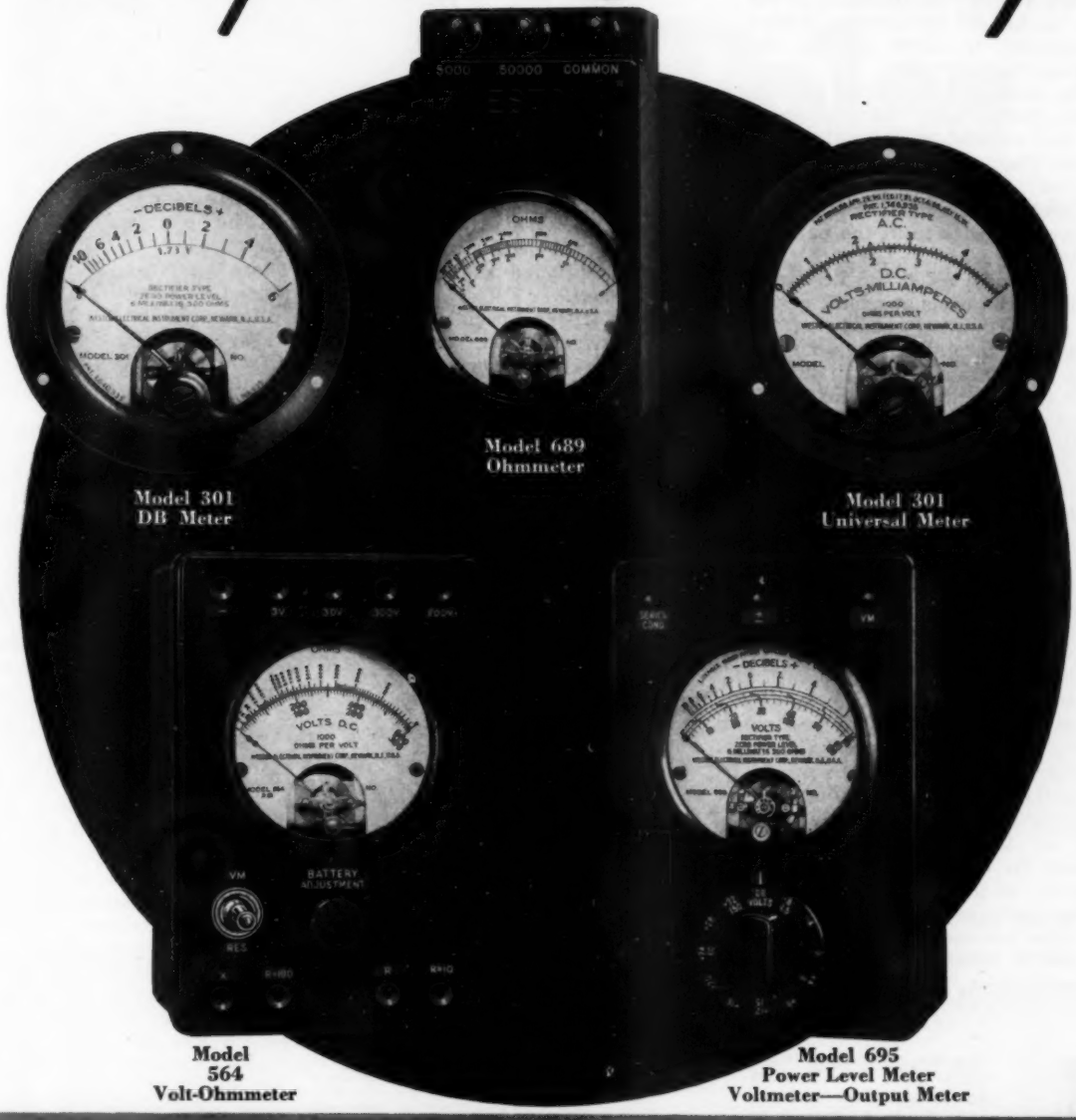
It is both interesting and surprising to note the great diversity and volume of construction and maintenance work that can be done with these inexpensive 1½-ton truck units. These small gangs operate in a field which in the past has been served by much heavier and more expensive equipment, ranging in size up to five tons' capacity.

The old-time, heavy-duty construction and maintenance units are rapidly being superseded by lighter types such as the LCW unit and the medium duty outfits represented by the "MC" trucks. The design and functioning of the MC truck is quite similar to that of the LCW. However, the body is somewhat larger, heavier, and correspondingly more expensive, in order to fit it for use with medium sized gangs operating with 2 to 2½-ton trucks.

Bodies for Carrying Pole-Setting Equipment

In connection with construction work where there is a considerable amount of pole setting to be done,

Undisputed Leadership



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DB Meter

Model 689
Ohmmeter

Model 301
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Model
564
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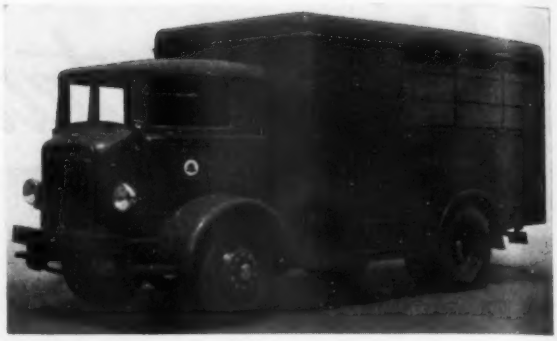
the earth-boring machine units are applicable. The body design for such trucks is necessarily different from that of the LCW and MC outfits. The earth-boring machine truck bodies, known as "EB" units, must be very strong—particularly in the rear, to handle the severe strains transmitted to them during the earth-boring operation.

The tools and materials carried on the earth-boring machine truck are less extensive in number and volume than on some of the other vehicles; less side-box space and less rearranging of the space are required in order to fit the particular items.

In this body, as in the LCW and MC units, the overhang back of the rear axle is limited because of the necessity of providing adequate stability. For instance, in lifting an auger filled with dirt out of a wet clay hole, the suction is so great that if there were excessive overhang back of the rear axle, the front end of the truck might be lifted off the ground. A somewhat similar condition exists in handling the pole derricks on all types of construction and maintenance bodies.

These trucks are supplied with small pole derrick support members which transmit the loads to the ground under the rearmost point of the body. However, these supports cannot be used where it is necessary to move poles suspended from the derricks. Also, the springs in the trucks are strong enough to handle, unaided, all of the light and some of the medium-sized poles without the use of the pole derrick supports, so that the stability from a short body overhang back of the rear axle becomes a very desirable feature in construction and maintenance trucks.

For highway delivery of such items as reels of cable, crossarms, conduit material, etc., open stake bodies, such as the type "M" unit, are applicable. While the M bodies have not as yet been standardized, they are mentioned as representative of a class.



The SD Type Truck Showing the Body Closed and the "Camel Back" Type of Front Construction.

In these trucks, special attention must be given to the under supports and the floor construction in order to carry safely the concentrated load which, in the case of some reels of cable, might amount to as much as three tons' pressure under one narrow reel flange. Other features of design in connection with this body have to do with suitable provision for tying down full and also empty reels, together with the proper width and length of body to accommodate the desired amount of material to be carried at any one time.

Specially Designed Truck for Private Right-of-Way

A rather highly-specialized type of delivery body is used with four-wheel-drive trucks for carrying reels of cable on private right-of-way. These trucks have been used very successfully in long lines work, to replace slow-moving caterpillar tractor trailer outfits. They have not as yet been applied outside the long lines department. Provision is made in this design for easily loading and unloading the heavy reels of cable and for holding them in position during the rough lurching ride which they experience when being hauled over private rights-of-way.

These four-wheel-drive outfits, equipped with powerful engines and very large pneumatic tires—dual in the rear and, when desired, also in the front—can negotiate unbelievably difficult private right-of-way conditions. It has been demonstrated on the job that they will deliver reels of cable to practically any place where this can be done with caterpillar tractors.

Obviously, their use results in a considerable saving in cost as well as in time, due to their much higher speed and to the fact that they can be used to pick up a reel of cable at a railroad siding and deliver it to location, as compared with the older method of hauling the cable by truck to the edge of the right-of-way, where the reels are unloaded and then picked up by caterpillar tractor trailer outfits. A very strong steel reinforced body of comparatively small size is used in the trucks handling this work.

As representative of present-day truck body development in another branch of the telephone field, the experimental supply delivery panel outfit might be mentioned. This large body carries supplies from central storerooms to garages at night, where the many items required by various installation, con-

The EB Type is a Four-Wheel-Drive Truck With Equipment for Boring Holes and Erecting Poles. At Right is Shown Another Four-Wheel-Drive Vehicle, a Heavy Duty Truck for Use on Highways or Private Rights-of-Way.

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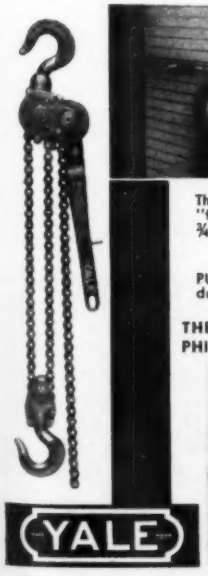

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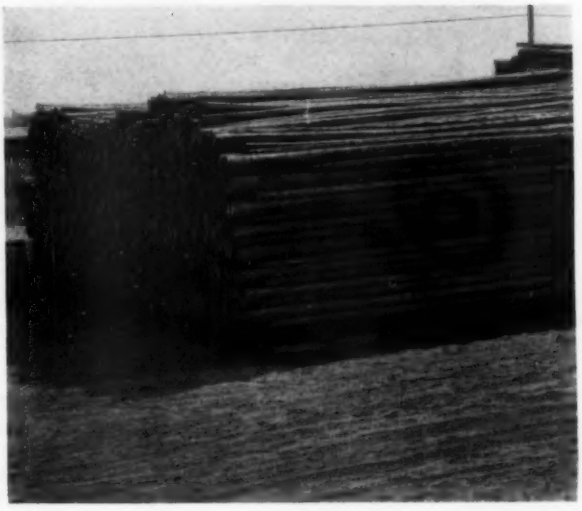

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struction and maintenance trucks are taken from the supply delivery body and distributed directly to the trucks which will use the supplies on the following day. The body is built as low as practicable in order to reach easily all portions of the shelving from the outside.

Long doors on each side of the body, hinged at the bottom, open down to a horizontal position, where they rest upon telescoping pipe supports pulled out from underneath the body. In this horizontal position the large aluminum doors serve as platforms from which all portions of the shelving can readily be reached. The bank of shelving facing out on each side of the body is of the commercial storeroom type except that it is made of aluminum alloy in order to reduce weight.

A convenient step is provided for the use of the operator in stepping up and down from the floor to the platform. When closed, these doors form a water-tight cover for the lower portion of the shelving; the upper portion is covered by light, strong metal and fabric curtains carried in weatherproof guides.

Inside this supply delivery body, between the two panels of shelving, is an aisle which extends along the middle to the front of the body and across the front, with doors at the rear and on one side in front. Since, with this design, access to the shelving is not necessary from the inside of the body, the T-shaped space inside is filled with bulky supplies which are removed as required and which do not interfere with access to the small material from the outside.

In order to permit easy maneuvering of this unit, with its long body—and also to economize in space required at the loading platform—a "camel back" (engine under the cab) type of chassis is being utilized.

As a further development in the supply delivery field, a design has just been completed covering a body coded "SD," of practically the same size as the one just mentioned but having radically different features. Access to the shelves in the SD body is entirely from the inside.

The space occupied by the shelving is practically the same as in the earlier body, but the shelving, in sections, is carried on four specially designed, caster-mounted, hand trucks, each of which when loaded will weigh approximately 1,200 pounds. These hand trucks are rolled out of the body and left in the storeroom during the daytime to be filled, while the truck is available for delivering booths or other supplies.

The SD Type Vehicle Is Designed for Carrying Supplies from Central Storerooms to Garages, Where Trucks Are Loaded at Night for the Next Day's Work.

In the evening the truck is returned to the storeroom; the loaded hand trucks, which, due to their design, can be handled by one or two men, are rolled into the positions provided for them in the truck body and clamped into place; and, as with the earlier body, the supplies are delivered to the waiting vehicles in various garages.

From the descriptions of features incorporated in these various representative truck bodies for their several types of work, it is evident that in order to handle this work economically and expeditiously, it is very desirable that each class of vehicle be studied with a view to adapting it to the type of service in which it will be used.

Ordinarily, in telephone work there is very little necessity for shifting a vehicle from one general class of work to another, and since a unit will probably be operated in a particular kind of service for from four to eight years, foresight in properly adapting the body to carry its greatly diversified load will pay large dividends through assisting the workmen in their day-to-day assignments over this long period of time.

Another factor, which has only been mentioned and which is given very careful consideration in all designs, is that of safety both to the public and to the workmen. When tools and materials, particularly of the heavy types, are carried in an orderly manner and provision is made for properly securing them in place, an important step has been taken toward safe operation.

By careful study, the number of types of bodies in the field is kept at a minimum consistent with proper utility, in order to obtain quantity production and thus lower prices in the manufacture. Taking the average vehicle life at five or six years for the 17,000 vehicles in the Bell System fleet, and considering the fact that a very large majority of these are work cars, it is realized that the average annual turn-over in work cars is large. As a result, there arises the important opportunity for securing beneficial results from proper truck body designs.

▼ ▼

Bell System Report for First Quarter

The American Telephone & Telegraph Co. reports a net gain of 201,000 telephones by the Bell System during the first quarter of this year, as compared with a gain of 113,000 in the corresponding period of last year. The average number of telephones in service was 3.8 per cent greater than during the first quarter of 1935. The number of toll and long distance calls represents a gain of 13 per cent.

The earnings report of the Bell System for the 12 months ended February 29, 1936, shows total net earnings of $205,749,644, an increase of $22,853,316 over the preceding fiscal year. After the payment of preferred stock dividends of Bell associated companies, amounting to $6,425,085, there was a net income of $8,477,692 applicable to common stock of associated companies and $138,645,729 applicable to A. T. & T. Co. stock.

The net income of the American Telephone & Telegraph Co. for the 12 months ending March 31, 1936, was $130,157,095, an increase of $11,240,863 over the preceding fiscal year. After the payment of dividends of $9 a share, amounting to $167,968,693, there was charged against net income the sum of $130,157,095 and against surplus the sum of $37,811,598.

The earnings of the A. T. & T. Co. are at the rate of $6.97 on a total of 18,663,188 shares of capital stock outstanding.

Activities of Commissions and Courts

Destruction Permitted of Surplus Directories

On April 8 the telephone division of the Federal Communications Commission adopted order No. 14-A which permits the destruction of surplus directories in conformity with the provisions of the "Regulations to Govern the Destruction of Records." The order reads as follows:

"The telephone division having under consideration its order No. 14 and subsection 120 of paragraph 20 of the 'Regulations to Govern the Destruction of Records of Telephone, Telegraph and Cable Companies (including Wireless Companies)' promulgated pursuant to the order of the Interstate Commerce Commission made on the 3rd day of November, 1919;

It is ordered that, effective this date (April 8) the items listed in said subsection 120 be, and the same are hereby, exempted from the provisions of said Order No. 14 and may be destroyed in conformity with the provisions of said 'Regulations to Govern the Destruction of Records.'"

▼ ▼

Denies Injunctions in Telegram Seizure Case

Chief Justice Alfred A. Wheat of the Supreme Court of the District of Columbia, on April 8, denied the application of William Randolph Hearst for an injunction restraining the Senate Lobby Committee from making any use of telegrams, subpoenaed from the files of the Western Union Telegraph Co., exchanged between Mr. Hearst and his editorial employes.

Mr. Hearst sought also to enjoin the Federal Communications Commission from "unlawfully" searching the files of telegraph companies and cooperating with the committee in a search for ammunition for use by the lobby investigators.

Chief Justice Wheat held that the court was without jurisdiction, as far as the Senate committee was concerned, and asserted that in his opinion it was better "to leave us without any remedy than it is for a court to assume jurisdiction to try to coerce or control a committee of the Senate."

In the matter of search and seizure of telegraph files by the FCC, Justice Wheat said that he was convinced he had the power to enjoin the commission from proceeding unlawfully. However, he said, the FCC had informed the court that its investigation was completed, that it had no copies of Hearst telegrams in its possession, and, therefore, the application for an injunction was denied "without prejudice to its renewal upon any evidence of further activities along the lines attacked here."

Elisha Hanson, counsel for Mr. Hearst, indicated that he would appeal the case to the Federal Court of Appeals for the District of Columbia. It appears fairly certain that the case will go to the U. S. Supreme Court, and Congress has appropriated $10,000 to be used by the Black committee in defending its position before the courts.

▼ ▼

FCC May Ask More Funds for Bell Investigation

Officials of the Federal Communications Commission on April 13 said President Roosevelt probably would be asked to decide whether additional funds should be sought to continue the FCC investigation of the American Telephone & Telegraph Co. The commission already has spent about $335,000 of the $750,000 appropriated for the purpose, officials said, and unless Congress appropriates an additional sum the investigation will end July 1.

With the present appropriation, it was said, public hearings on activities of the Bell System can be continued intermittently for only two more months. Thus far, Commissioner Paul A. Walker, directing the investigation, has made no direct request for more funds. In a report to Congress (TELEPHONY of January 18, page 16), however, he said that if all phases of A. T. & T. operations were to be investigated another appropriation would be needed.

Other FCC officials said there was sentiment within the commission for continuance of the inquiry, but that the whole question probably would be placed before Mr. Roosevelt before any requests for funds were sent to Congress. The President's advice will be asked, it was said, because the investtigation might be considered to reflect general administration policies.

Originally scheduled to be resumed on April 14, public hearings before the commission in the investigation were postponed until April 20 by the commission on April 8.

The action was taken at the request of President Walter S. Gifford of the A.

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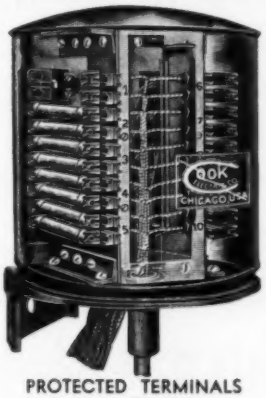
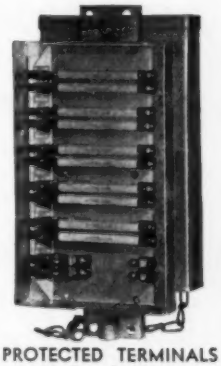
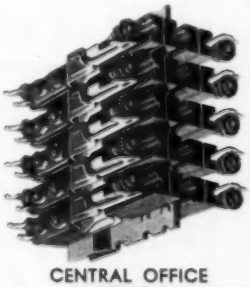


PROTECTED TERMINALS
11 to 51 pair



PROTECTED TERMINALS
4, 5 and 6 pair

UNPROTECTED TERMINALS



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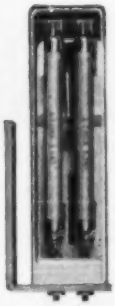

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"Telephony's" Engineering Data

By B. C. Burden

Index, Maintenance Practices.
April 18, 1936.
No. 6-A, Page 7.

Key No. 3 permits switching the visual volume indicator from the fixed to the variable networks. It should be noticed that key No. 2 and key No. 3 must be operated together when testing individual receivers or transmitters against the receivers and transmitters in the standard circuit.

Key No. 4 permits switching a transmitter under test, which is plugged into the common battery jack, in and out of the standard circuit when testing a transmitter against the standard common battery transmitter. Key No. 4, key No. 2, and Key No. 3 *must all be thrown together* in order that, when talking into the standard transmitter, the standard substation set circuit is connected to the fixed network

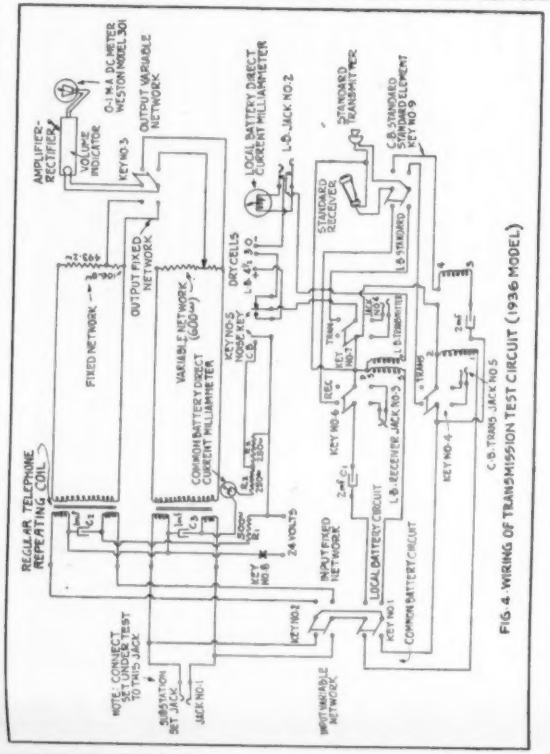

FIG 4. WIRING OF TRANSMISSION TEST CIRCUIT (1936 MODEL)

"Telephony's" Engineering Data

By B. C. Burden

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No. 6-A, Page 8.

and the volume indicator to the fixed network. When talking over the transmitter under test, the substation set circuit should be connected to the variable network and the volume indicator to the variable network.

Key No. 5 is referred to as the "noise key." Its purpose is to increase the current flowing in the common battery transmitter by short-circuiting a portion of the limiting resister (R_2, R_3), thus increasing the transmitter's noise tendency. On local battery transmitters, the key changes the supply from two to three cells. Transmitters which are inclined to be noisy, are readily detected by the additional current-flow condition that is established when key No. 5 is operated.

Key No. 6 is used to transfer the receiver under test in and out of the standard substation set circuit. Inasmuch as the same type of receiver is used on common battery and local battery circuits, the test unit is so designed that *all receivers are tested in the local battery substation set circuit.*

Key No. 7 permits transferring a local battery transmitter under test in and out of the standard circuit and functions in the same manner as key No. 4 in the common battery circuit.

Key No. 8 is merely a single-pole, single-throw switch, which disconnects the 24-volt battery from the circuit when common battery transmitters are not being tested. Key No. 9 is used to transfer the standard receiver and the standard transmitter from the local battery circuit to the common battery circuit.

When testing local battery elements, the standard receiver and transmitter are thrown on the LB side, and when testing common battery elements, the key is thrown on the CB side.

Jacks Used for Convenience

The various jacks in the circuit are for use as follows: Jack No. 1 is for use in connecting the substation set under test to the variable network. A two-conductor cord and plug, equipped with test clips, facilitates the testing of a number of substation sets. Jack No. 2 permits connecting the local battery DC milliammeter in series with the dry cells which supply the transmitter of a local battery substation set.

Jack No. 3 is the jack into which the local battery receiver or the common battery receiver under test is plugged. Jack No. 4 is for use in connecting the local battery transmitter under test to the standard substation set.

Jack No. 5 is used in connecting a common battery trans-

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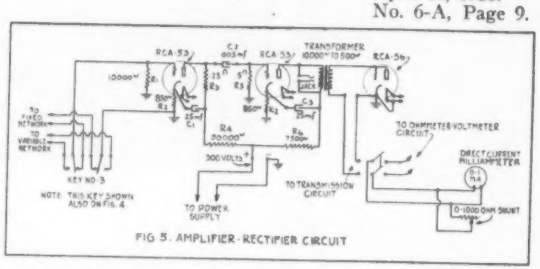

FIG 5. AMPLIFIER-RECTIFIER CIRCUIT

mitter under test to the standard common battery circuit. The two microfarad condenser, C_1, prevents direct current from the 24-volt battery backing up into the local battery substation set circuit in the event that switch No. 8 is left on when local battery transmitters are being tested.

The resistors, R_1, R_2, R_3, are merely limiting resistors. They limit the amount of current reaching the transmitter under test, in order to simulate the actual conditions under which common battery transmitters generally operate. Condensers, C_2 and C_3, permit feeding current at the midpoint of the repeating coil winding.

Amplifier Rectifier Circuit

The visual volume indicator requires the use of a sensitive audio amplifier and a diode rectifier unit. A sensitive direct-current 0 to 1 scale milliammeter is connected in the cathode circuit of the diode rectifier.

The audio frequency voice voltage to be measured is fed into the input of the amplifier. There it is amplified and passed to the diode rectifier, where it is converted from alternating current into direct current. The rectified current flows through the direct current milliammeter, giving a deflection proportional to the applied alternating current voltage.

Fig. 5 illustrates the circuit of the amplifier rectifier. The power-supply unit is shown in a separate circuit diagram.

It will be noticed (Fig. 5) that the amplifier consists of two type 53 radio tubes, connected in tandem. The output of the second tube is connected by means of an impedance matching transformer to a type 56 radio tube, which has its grid and plate tied together, and which functions as a diode rectifier. The term "diode" merely means a *two* element rectifier.

T. & T. He said he would be attending the company's annual meeting during the week of April 14.

The hearings were recessed on April 2 until April 14 to give the FCC investigators time to examine company records in New York City. When the hearing reopen testimony will be taken to lay the groundwork for a broad study of A. T. & T. rates.

These hearings are expected to center on the company's methods of figuring depreciation, the cost of manufacturing telephone equipment, and whether unnecessary telephone plant facilities have been included in estimates of value for ratemaking purposes.

The nature of A. T. & T. "license contracts" with operating companies of the Bell System also will be considered.

▼ ▼

Regulations in Regard to Social Security Act

The United States Independent Telephone Association has recently mailed to its member companies copies of regulation 90 of the Treasury Department, having to do with the unemployment insurance act. President F. B. MacKinnon, in an accompanying letter dated April 6, states that the particular section that is of interest to many companies is article 204 on page 4, which analyzes "who are employees." The letter reads, in part, as follows:

"Companies having agency contracts for the operation of exchanges are immediately interested as to whether those agents are employes or contractors. We want to call your attention to the third paragraph on page 5, which begins with 'Generally, the relationship exists . . .'

"The nature of the contract will probably determine the classification of the agent. Generally speaking, those agents are controlled by the employer 'not only as to what shall be done but how it shall be done.' We are making a request of the Treasury Department for a special ruling on the classification of such persons in relation to telephone companies. We hope to be able to issue another bulletin shortly containing a ruling of the Treasury Department on this particular point."

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State-Wide Inquiry Begun of Bell in Arkansas

A general investigation of rates of the Southwestern Bell Telephone Co. in 86 cities and towns in Arkansas got under way on March 26 following issuance of an order by the Arkansas Department of Public Utilities directing the company to file inventories and appraisals of its plants in these municipalities. These will be checked by the department engineers and accountants and will be compared with rates in individual towns to determine whether rates are equitable.

The order consolidated seven telephone rate cases which had been appealed to the state commission by the Southwestern Bell after the city councils had passed ordinances reducing rates. The cities involved were El Dorado, Rogers, Bentonville, Walnut Ridge, Helena, West Helena and Hope.

The commission at the same time gave tentative approval of a rate reduction for El Dorado which will save subscribers approximately $5,000 a year. The new rate schedule is to continue in effect pending completion of the statewide investigation.

Full cooperation of the telephone company in the investigation was pledged by W. E. Gosdin, division general manager.

Mr. Gosdin stated that "books of the company indicate a return in 1935 of about 3 per cent on the investment of the company in Arkansas. As a matter of fact, for the past five years we have averaged only approximately 3 per cent, as reports on file with the department will show. As for the 86 exchanges we operate, some earn more, some earn nothing, some are operated at a loss.

"Whatever the final outcome, the telephone company has no disposition on its part to charge more than the facts justify."

▼ ▼

Installation and Other Charges Ordered Reduced

The Michigan Public Utilities Commission recently ordered the Tri-County Telephone Co., of South Haven, Mich., to eliminate surcharges on much of its special equipment and to sharply reduce rates on the installation of equipment, effective June 1. R. K. Holland, chief engineer of the commission, estimated the order will cut company's income approximately $7,000 a year.

The commission directed the company to eliminate its present charge of 25 cents a month for desksets within the base rate area and discontinue its charge of 25 cents a month on handsets in cases where they have been used by subscribers for more than three years.

The order abolished the company's practice of granting discounts and assessing penalties to encourage prompt payment of bills in certain areas. It directed that tolls be charged on commercial lines for all inter-exchange calls.

The order reduces the charges for installing business telephones in exchanges of over 500 stations from $4.50 to $3.30. Business telephone installations in exchanges under 500 stations

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will cost $2.50 instead of $3.25. The charge for residence installation is reduced from $3.50 to $2. The maximum charge for installation of miscellaneous equipment was cut from $2 to $1.

The commission ordered the company to cease the practice of allowing subscribers to furnish and maintain their own instruments. That practice must be eliminated by June 1, 1937.

Rate hearings, on which the present order of the commission is based, began in 1934 on petitions submitted by residents of Dowagiac, Paw Paw and South Haven. The company serves several counties in the south and western parts of Michigan and an area in northeastern Michigan.

A second commission order dealing with the same company permits it to issue $1,500,000 worth of securities to retire present indebtedness and consolidate its outstanding accounts.

▼ ▼

Rising Expenses Make Rate Increase Necesasry

The Marne & Elk Horn Telephone Co., of Elk Horn, Iowa, has increased telephone rates 25 cents a month to meet mounting expenses, according to Harold Johnson, manager. The present rates are $1.00 per month for wall sets and $1.25 a month for desk sets.

Increased costs will result this year because of taking the lines off Main street and changing lines along roads which will be widened. Twelve miles of rural lines must be moved, Mr. Johnson said. The company also faces *five* new tax levies.

▼ ▼

Handset Charge Limited to Three-Years' Usage

The Southern New England Telephone Co., effective May 1, will discontinue the present charge of 15 cents monthly on handsets which have been in use for three years. The change affects 50,000 of the company's 300,000 stations, and will reduce its revenues approximately $90,000 annually.

The Indiana Bell Telephone Co. and several other units of the Bell System are following a similar policy. This program is in keeping with the plan outlined by Walter S. Gifford, president, in his 1935 report, of reducing such charges as rapidly as conditions permit. Of the 13,900,000 Bell System installations, approximately 4,850,000 are handsets.

▼ ▼

Rates Ordered Reduced at St. Paul, Minn.

Telephone rates in St. Paul, Minn., where the Tri-State Telephone & Telegraph Co. operates, on March 31 were ordered cut an average of 15.61 per cent, with some reductions ranging as high as 30 per cent, effective May 31.

The reduction, scheduled to save St. Paul telephone subscribers $514,000 annually, was ordered in a unanimous decision of the Minnesota Railroad & Warehouse Commission, in which it held that present rates, in effect since October, 1933, are "unjust, unreasonable and unlawful."

The new schedule applies to all in the St. Paul metropolitan area, including South St. Paul, North St. Paul, St. Paul Park, Mendota, New Brighton and Rose Town.

R. F. Wilder, general manager of the company, stated the order "seems so drastic and unreasonable that in order to protect the service, the employes, and those who have invested their money in the business, it will be necessary for the company to appeal to the courts."

The order climaxed a seven-year battle by the commission to reduce St. Paul telephone rates. The commission started a general investigation of telephone rates throughout the state in August, 1929. This led up to an investigation of St. Paul rates, which began April 5, 1932, and concluded December 19, 1934.

The commission then ordered a temporary 15 per cent cut in rates, but the Tri-State Telephone & Telegraph Co. immediately appealed to the federal

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Associate Professor of Communication Engineering, Oregon State College

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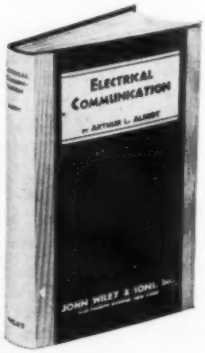

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court and obtained a temporary injunction which was dismissed last January, ending, for the time being, the commission's fight for lower rates. As a concession the company did grant minor reductions during the pendency of the previous order, but these were unsatisfactory to the commission.

The present order is based on a "reasonable valuation" of $88,500,000 in the company's property as of 1933. It allows a return of 6 per cent on that valuation, or $510,000 based on 1933 business, but adds that the actual net earnings of the company for that year were 16.17 per cent of its valuation, instead of the allowable 6 per cent.

This return, the commission held, was "excessive and unreasonable." It added that the financial operations of the company since 1933 have been "more favorable rather than less favorable to profitable operations and to enhance profits secured by the company as compared with 1933."

▼ ▼

New York Commission Makes Reduction Permanent

The New York Public Service Commission on April 8 issued an order requiring the Upstate Telephone Corp. of New York, Johnstown, to make permanent the reduced rates in effect since March, 1935, and designed to effect subscriber savings of $43,000 annually.

The commission also ordered a reduction from 25 to 15 cents a month in the charge for handset telephones and stipulated that the minimum season levy be reduced to the charge for four months. These charges, the commission estimated, will save an additional $5,000.

The corporation, formerly the Glen Telephone Co., is the third largest in the state.

▼ ▼

Permanent Injunction In Oregon Rate Case

The Pacific Telephone & Telegraph Co. on March 19 was granted a permanent injunction by Circuit Judges Tucker, Lusk and Brand, sitting en banc, preventing from going into effect the 8 per cent reduction in telephone exchange rates to Oregon subscribers, ordered by former Commissioner Thomas. The decision was the climax of a long-fought controversy between the telephone company and Mr. Thomas which started on March 25, 1931, when the commissioner ordered an investigation of the company.

The judges held in their decision that the reduced exchange rates ordered by Mr. Thomas, which would result in a reduction in revenues amounting to more than $1,000 a day, would be confiscatory in character and, therefore, a violation of the due process clause of the 14th amendment to the constitution.

They took into consideration, they announced, in arriving at their unanimous decision, the fact that the telephone company was not entitled to escape its share of the common loss in time of depression.

The effect of the court's action was to make permanent a temporary injunction which had been issued October 30, 1934, preventing enforcement of the reduced rates which, in accordance with the commissioner's order, were to have become effective November 1 of that year.

The decision came after a long hearing in January of this year before the three judges, sitting en banc, during which evidence and arguments were presented for the utilities commissioner by Alfred P. Dobson, the commissioner's attorney, and Ralph Moody, assistant attorney-general, and for the telephone company by Omar C. Spencer and Fletcher Rockwood.

▼ ▼

San Antonio, Texas, Rate Case Reopened

The San Antonio, Texas, rate case of the Southwestern Bell Telephone Co., was reopened Monday, March 30, when Judge E. R. Holmes granted the San Antonio Utilities League, as an intervenor, the right to appeal the settlement of the case to the United States Circuit Court of Appeals. Charles M. Dickson, attorney for the league, filed a petition of appeal and assignments of error in the United States District Court in San Antonio and posted $500 appeal bond.

The petition asks the appeals court to enter a decree refunding $2,250,000 in telephone fees collected by the company in excess of the 1918 city ordinance fixing rates during the pendency of the suit from 1928 to 1935.

In the alternative it is asked that the court reverse and remand the judgment to the trial court instructing it to grant the intervenors a hearing and order refund of the excess fees. It is set out the telephone company should be required to prove the 1918 ordinance fixing the telephone rates was invalid because it was confiscatory.

Alleging it was not agreed in the consent decree that the ordinance was invalid, the petition sets out the ordinance was valid. It is claimed that the excess fees collected during the pendency of the suit constituted a trust fund protected by a temporary injunction and that the $2,250,000 remaining in the fund be refunded to the subscribers.

Attorney Dickson stated the 1918 ordinance had been held valid by Judge Holmes in a judgment reversed and remanded by the appeals court. He pointed out, however, the appeals court had not

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considered the merits of the case when it was reversed. It was stated that the intervenors' appeal does not attempt to regulate future rates or present rates of the telephone company. The 1918 rate fixing ordinance was rescinded by the city council on December 26, 1935.

As the result of an agreed judgment the company has refunded approximately $750,000 to subscribers.

▼ ▼

Rate Probe Ordered of West Virginia Company

The West Virginia Public Service Commission, on its own motion, has ordered an investigation of the rates and tolls charged by the Bluefield Telephone Co. and of the service furnished to its 8,000 subscribers. The company serves McDowell and Mercer counties.

On September 9, 1935, the commission directed its engineers to make an inventory and appraisal of the telephone company's property, and its accounting department to make an audit of its books. This work, the commission said, now is about completed.

Earl H. Morris, the commission's chief engineer, was directed to go to Bluefield to investigate the telephone company's service, and to make a report of his findings not later than April 10.

▼ ▼

Nicholville, N. Y., Telephone Properties Sold

The sale of the Nicholville Home Telephone Co., which furnishes telephone service in and around Nicholville in St. Lawrence county, New York, has been consented to by the New York Public Service Commission. The property is to be sold by John W. Benton, as receiver of the Brasher Falls National Bank, to Edwin E. Chambers for a consideration not to exceed $8,884.35.

The order of the commission determines that the transfer of the property is in the public interest only if made subject to certain specified conditions relating to the books and accounts of the company. The property is to be transferred free and clear from all liens and encumbrances. The approval of the commission is not a determination of the value of the property.

The commission also granted Mr. Chambers a certificate to operate the telephone system he acquires by the purchase of the physical property of the Nicholville company, including poles, wires, etc. The commission estimated the original cost of the property at $27,609.43 and the accrued depreciation at $17,050.91., leaving an estimated original cost less accrued depreciation of $10,558.52. The same rates as now charged will be continued in effect by Mr. Chambers.

Answers to the Traffic Questions on Page 24

1. Write out a new OUT ticket and proceed as on a new call. Enter the time that the change in ticket directions is received, encircled, in the "Filing Time" space on the new ticket and cross-refer the new ticket with the original.
2. Refer the case to your supervisor, chief operator or employe locally designated to handle such cases.
3. The supervisor or chief operator will reach the calling party and advise him that a report charge will be assessed for each toll center from which a chargeable report is incurred and will explain that such a charge is made for the effort to complete the call. She will then instruct the operator in accordance with the action taken.
4. Ring for one minute. If the called station does not answer, give a DA report.
5. It may interfere with conversation by causing the connection to cut out and in some instances may result in a cut-off.

▼ ▼

Stock Issue Granted Nebraska Rural Company

The Hamilton County Farmers' Telephone Association has been granted permission by the Nebraska State Railway Commission to issue $10,000 of 5 per cent preferred stock. The company is a mutual conducting its business without profit and operates exchanges for local and rural service at Aurora, Doniphan, Giltner, Hampton, Hordville, Marquette, Phillips, Stockham and Trumbull. It has outstanding $7,000 shares of 7 per cent preferred stock of a par value of $100 and $48,630 of common stock of a par value of $15 per share. It was incorporated in 1901.

Common stock shares number 3,242, held almost entirely by rural subscribers, and bear no interest. The number of substations has been reduced from 3082 in 1931 to 2287 in 1934. Three were added during 1935. Revenues have declined from $52,600.91 in 1931 to $42,106.09 in 1934. The 1935 total, based on ten months' experience, indicates another drop of $1,000.

In spite of the fact that officers' salaries, operators' wages and salaries of clerks have been reduced over the period of four years and no more maintenance work done than was absolutely necessary, the company shows the following operating deficits: For 1932, $309.12; for 1933, $1,083.18; for 1934, $2,825.51 and for ten months of 1935, $5,600.07.

The purpose of the application was to reduce interest obligations. Most of the $7,000 7 per cent preferred stock outstanding was issued with a reservation permitting recall, and officers anticipate no difficulty in placing the $10,000 issue at 5 per cent. All of the old stock that is callable will be retired and the new issue, which is limited to $10,000, issued.

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Commission Rulings and Schedule of Hearings

Federal Communications Commission, Washington, D. C.

April 8: Order No. 14-a adopted by telephone division. This order grants relief to all telephone companies subject to the jurisdiction of the commission from the provisions of telephone division order No. 14, requiring the retention—until otherwise authorized or ordered by the commission—of all copies of telephone directories in the custody of the companies. The order permits the destruction of surplus directories in conformity with the provisions of the "Regulations to Govern the Destruction of Records."

April 8: Telephone division granted authority to the Inter-Mountain Telephone Co., of Bristol, Tenn., to string an additional pair of copper wires between Bristol and Abington, Va., a distance of 15.2 miles, to provide an additional telephone circuit.

April 16: Hearing in Philadelphia in re applications of the following persons for authority to hold positions with more than one carrier under section 212 of the Communications Act of 1934: W. S. Carpenter, Jr., Wilmington, Dela., and J. H. Crosman, Jr., F. I. Daly, W. H. Harrison, H. C. Kunkel, J. E. Murdoch, C. L. Ritchie, Katherine H. Wallace, C. W. Hazard, W. H. Lamb, A. H. Osterman, P. C. Staples, H. C. Young, T. H. Griest, G. T. Cartier, F. C. Durant, Jr., R. K. Stevens and J. F. Stockwell, all of Philadelphia.

April 20: Hearing continued to this date from April 14 in the investigation of the American Telephone & Telegraph Co. by the telephone division of the FCC.

June 15: Hearing at which all radio and television interests are expected to be represented. T. A. M. Craven, chief engineer of the FCC, recommended in a report that television be kept on an experimental basis until it has been determined what effect it would have on radio broadcasting, newspapers and the motion picture industry.

Illinois Commerce Commission

April 6: Hearing in Chicago on the commission's citation, on its own motion, against the Illinois Bell Telephone Co. to show cause why there should not be a reduction in rates for intrastate telephone service rendered by the company in the state of Illinois.

April 15: Hearing in Chicago on complaint of William D. Martin against the Illinois Bell Telephone Co. as to failure to furnish telephone service to complainant at 726 N. Avers Avenue in Chicago.

April 16: Hearing in Chicago on application of the Flanagan Telephone Co. for an order authorizing the issue of $4000 of its common stock.

Missouri Public Service Commission

April 10: Application filed by the Citizens Public Service Co. of Missouri to file rate schedule for common battery service at Eldorado Springs.

New York Public Service Commission

April 8: Order issued requiring the Upstate Telephone Corp. of New York, Johnstown, to make permanent the reduced rates in effect since March, 1935. Extra charge for handset telephones re-

(*Concluded on page* 52)

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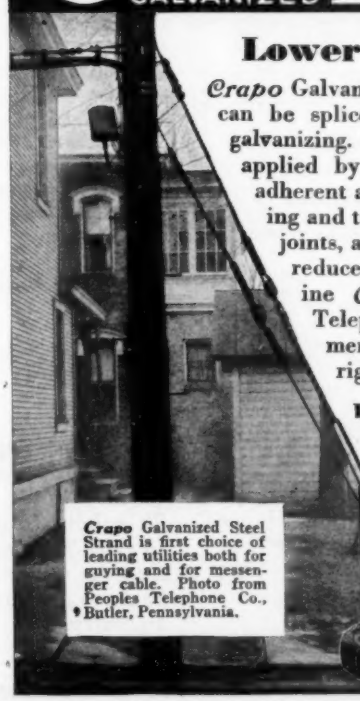

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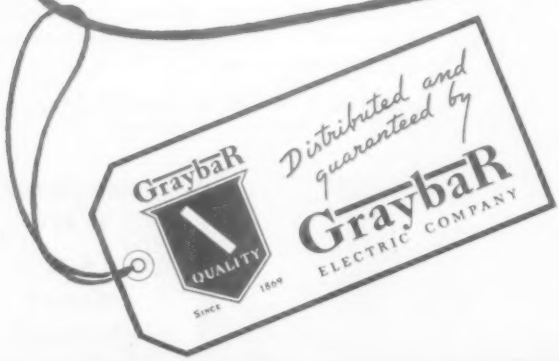

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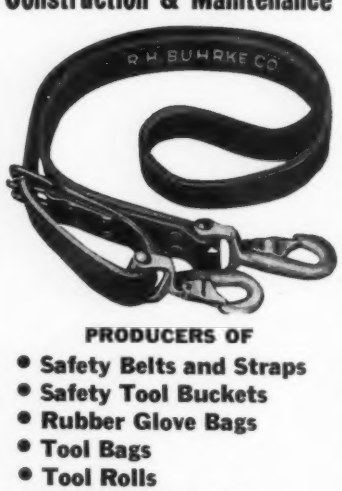

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R. H. BUHRKE CO.
CHICAGO

(*Concluded from page 49*)

duced from 25 cents to 15 cents a month.

April 10: The New York Telephone Co. filed revision of rates covering the introduction of season rates in that portion of the Angola central office district which is within ¾ths of a mile from the shore line of Lake Erie in Erie county. There are in this area in which season rates are to be made effective May 1, about 130 subscribers of whom about 75 take service only for the summer months. The development in this area is predominantly seasonal in character.

Season rates are already in effect throughout the Derby and Wanakah central office districts and are also in effect in the adjoining central office district of Silver Creek. Seasonal subscribers in the Angola districts have not had season rates and the change is to remove this inequality.

It is stated that the season subscribers in Angola demand a higher grade of service than rural line service and that it is necessary to construct a substantial amount of additional plant to meet this demand. This construction is under way and will be completed in time for service to be furnished next season.

April 10: The Columbia & Rensselaer Telephone & Telegraph Co. filed revision of its tariff schedule which provides that the service connection charge will be refunded in monthly allowances over a period not to exceed one year, where the equipment is in service at the end of one year from the date of installation. The refunds are to apply as a credit against rentals charged. The revisions also reduce the charge for moving a telephone instrument from one location to another in the same premises from $3.00 to $1.50.

The changes become effective May 1 in the entire territory of the company which includes a wide area in Columbia and Rensselaer counties. The company has exchanges at West Lebanon, Nassau, Berlin and Canaan. The commission permitted the changes to become effective without giving approval or disapproval. The revisions mean reductions to telephone subscribers of the company.

West Virginia Public Service Commission

March 27: Order issued on commission's own motion directing an investigation of the rates and tolls charged by the Bluefield Telephone Co., and of the service rendered by the company to its 8,000 subscribers. A preliminary hearing was scheduled for April 10 in Bluefield.

Wisconsin Public Service Commission

April 14: Application filed by Wisconsin Telephone Co. asking for a rehearing leading to reconsideration of the commission's recently-ordered rate reductions. The application charged that the commission's order contained many inaccurate statements and erroneous conclusions. It also said the order would work a serious injustice on the company if made effective.

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Buyer's Weelky Guide

A list of firms and companies offering equipment, supplies or services for operating telephone companies

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Burroughs Adding Machine Company, Second Blvd., Detroit, Mich. — Adding, Bookkeeping, Calculating, Billing and Accounting Machines, Electric Carriage Typewriters, Standard Typewriters, Operator Correct-Posture Chairs. Burroughs machines are in use today in hundreds of progressive telephone companies throughout the country.

BATTERIES—DRY CELLS

Burgess Battery Co., Freeport, Ill.—Burgess Flashlights and Uni-Cel Flashlight Batteries—for dependability and service. The Burgess Twin-Six Telephone Battery—a 3-volt unit designed to replace two No. 6 cells, with longer life, lighter weight, smaller size and a leakproof case. The Burgess Little-Six—replaces the old type No. 6 cell, is smaller and lighter, will not ooze or bulge, has all the electrical capacity of the standard No. 6 cell.

National Carbon Company, 30 E. 42nd St., New York.—"Columbia" Telephone Dry Batteries; "Eveready" Flashlights, Flashlight Batteries and Long Life Dry Cells, "National Pyramid" brushes, carbon, graphite and metal graphite for motors, generators and rotary converters. "Eveready" Prestone anti-freeze; "Eveready" Rustone rust preventive; and "Eveready" Air Cell telephone operators' transmitter batteries.

BATTERIES—STORAGE

The Electric Storage Battery Company, Allegheny Ave. and 19th St., Philadelphia, Pa.—Exide Storage Batteries. Branches: Boston, New York, Rochester, Philadelphia, Pittsburgh, Washington, Atlanta, Cincinnati, Cleveland, Detroit, Chicago, Kansas City, Minneapolis, St. Louis, Denver, San Francisco and Seattle.

Philco (Battery Division) Tioga and C Streets, Philadelphia, Pa.—Philco Flote in Steel-Glass Storage Batteries for P. B. X. and central office operation. Your old batteries will command a liberal allowance toward any Flote in Steel-Glass Cell from 10 A.H. to 1056 A.H. Write now for catalog ...it will tell you the complete story of Flote in Steel-Glass—the finest of telephone batteries.

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General Electric Company, Bridgeport, Conn.—Tungar battery chargers. G-E pole line hardware. Cable filling compound.

North Electric Mfg. Co., Galion, Ohio. — Self-regulating battery chargers.

CABLE—LEAD ENCASED

American Electrical Works, Phillipsdale, R. I.—Paper telephone cable, switchboard cable, bare copper wire. Chicago Office: 20 N. Wacker Drive; Cincinnati: Traction Bldg.; New York: 100 E. 42nd St.

British Insulated Cables, Ltd., Surrey House, Embankment, W. C. 2, Factory: Prescot, Lancashire, England.—Telephone cable of all sizes and capacities.

General Cable Corporation, 420 Lexington Ave., New York, N. Y.—Paper telephone cables of standardized manufacture for over forty years. Weatherproof and insulated copperweld drop wire.

Eugene F. Phillips Electrical Works, Ltd., Montreal, Can.—For any type of wire or cable used in telephone, telegraph or power work get in touch with "Phillips." Manufacturers of bare and insulated copper wires, rubber insulated wires, enameled wire, magnet wire, telephone cables, power cables, switchboard cables, flexible cords, copper rods, etc.

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National Telephone Supply Company, 5100 Superior Ave., Cleveland, Ohio.—National Cable Rings, National Splicing Sleeves, Non-Breakable Messenger Cable Hangers, Marlin and Swisher Cable Hangers and Custom Galvanizers. National cable rings are practical because they are two-way,—they allow the cable to be pulled in either direction. National sleeves make secure the weakest points in the line. If it's a splice—make it a National.

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Cook Electric Company, 2700 Southport Ave., Chicago, Ill.—Protective Pole Cable Terminals, Unprotected Pole Cable Terminals, central office protection, lighting arresters, sleeves, fuses.

Reliable Electric Company, 3145 Carroll Ave., Chicago, Ill.—Complete line of cable terminals, telephone and switchboard protectors, sleeves, fuses, solderless wire connectors and specialties.

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International Creosoting and Construction Company, Galveston, Texas—Creosoted Southern Yellow Pine Poles. Plants: Beaumont and Texarkana, Texas.

Jordan Bros. Lumber Co., Box 84, Norfolk, Va.—Virginia White Cedar Poles. Plain or charred and creo-treated butts.

MacGillis & Gibbs Company, Milwaukee, Wis.—Northern White and Western Red Cedar Poles. Plain or butt-treated. Immediate quotations on request.

Michigan Pole & Tie Company, Newberry and Grand Rapids, Mich. — "Poles with Character." Northern White and Western Red Cedar. Strategically located yards, Minneapolis, Minn., and Reed City (Lower Michigan), insure quick deliveries.

H. Sigalet & Company, Ltd., Lumby, B. C., Canada — Western Red Cedar Poles. Plain or Butt treated.

Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.—Finished Cedar Poles. Plain or Butt treated.

SUPPLIES, SWITCHBOARDS AND INSTRUMENTS

American Automatic Electric Sales Company, 1033 West Van Buren Street, Chicago, Ill.—Public Automatic Telephone Systems, Private Automatic Telephone Systems, Central Battery and Magneto Manual Telephone Switchboards, Remote Control Switchboards, Telephone Instruments of all types, Battery Eliminators, Charging Equipment, Signaling and Control Apparatus, Cords, Wires, Cables, Monotype Copperweld Drop Wire, and a complete line of construction materials and supplies.

Automatic Electric Company, 1033 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Telephones, relays, signalling and control equipment.

Automatic Electric Company, Ltd., Milton Road, Edge Lane, Liverpool, England. —Automatic Telephone Equipment.

Automatic Electric Sales Company, Ltd., 1027 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Manual Telephone Equipment, telephones, storage batteries, wire, cable, poles, etc.

Kellogg Switchboard & Supply Company, Adams & Aberdeen Sts., Chicago, Ill.—Engineers and designers, manufacturers and suppliers of complete equipment for telephone exchanges and communication systems. Manufacturers of "Master-built" Common Battery, Magneto and PBX Switchboards, "Masterphone" Telephone Instruments, and a complete line of telephone supplies, including bronze drop and interior wire.

North Electric Manufacturing Company, Galion, Ohio—Machine switching telephone systems. Automanual and Automatic. "All-Relay" Switching Apparatus (Dialless and Dial Control). Unattended Satellite Systems. Dials (automatic).

Siemens Brothers & Company, Ltd., Woolwich, England—Automatic and Manual Telephone Equipment.

Stromberg-Carlson Telephone Manufacturing Company, 100 Carlson Road, Rochester, N. Y. — Telephone apparatus of all kinds, switchboard cords, cable and general telephone supplies.

TOOLS

Crescent Tool Co., Jamestown, N. Y.—CRESTOLOY Pliers, Curved Needle Nose Pliers, Heavy Diagonal Cutting Pliers, Linemen's Side Cutting Pliers, End Cutting Nippers, Crescent Hack Saws.

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POSITION WANTED—Wire chief or troubleman, local or common battery. Married. Claude R. Wiandt, Rt. 6, Jackson, Tenn.

Flood Repair Work Around Williamsport, Pa.

The gigantic task of the restoration of telephone service to 11,000 Williamsport subscribers of the Bell Telephone Co. of Pennsylvania was virtually completed on Saturday, April 11. Williamsport was visited by one of the worst floods in history, March 17 and 18, when the waters of the Susquehanna river reached a height estimated at two feet higher than the previous record flood stage of June 1, 1889. Two-thirds of the city was under water.

Seepage of water into the underground cable system of the telegraph and telephone companies rendered the cables useless, and the city was completely isolated during the peak of the flood. The water also ruined large sections of the dial system and soaked the toll switchboard for several feet above the floor.

The Ralston Telephone & Telegraph Co., with headquarters at Trout Run, 14 miles north of the city, suffered practically no loss during the flood and was able to maintain local and long distance service during the period Williamsport was isolated. Through this channel Williamsporters were able to get word out to their friends and relatives.

Hundreds of telephone plant men from the eastern states were sent to Williamsport and other Pennsylvania points when the full extent of the flood damage could be ascertained. Ohio, Delaware, New York, New Jersey and Maryland were represented there as the gigantic task of making business and social contacts by wire were being accomplished.

These men worked long hours during the emergency. Many miles of cable had to be pulled from conduits and replaced by new material. The cable system of the main plant had to be entirely renewed.

The Western Union Telegraph Co. had to renew its cable system throughout. The Postal Telegraph Co. suffered likewise. Neither telegraph company was able to work its teletype machines on the shaky wires which were provided by running emergency loops. So a general call was sent out for all available telegraph operators to handle the deluge of telegrams which were being filed, as the telegraph companies were the first to provide outside communications.

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Prices in the Metal Markets

NEW YORK, April 14: Copper—Quiet. Electrolytic spot and future, 9.50c per lb.; export, 9.20c. Tin—Steady. Spot and nearby, 47.12½c per lb.; future, 46.12½c. Iron—Quiet, unchanged. Lead—Steady. Spot New York, 4.60@4.65c.